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**Knowledge Transformation and Representation:
Towards More Informed Provision and Use of Information**

Yvonne Marie Sutton

**A thesis submitted in partial fulfilment of the requirements of
Sheffield Hallam University
for the degree of Doctor of Philosophy**

August 2000

**‘Where is the knowledge we have lost in information?’
(Eliot, 1963: 161)**

Abstract

This thesis seeks to better understand the nature of, and relationships between knowledge, data and information. The context selected for this work was clinical practice in the UK National Health Service (NHS) beginning with the generation and use of clinical knowledge. The thesis undertakes a critical examination of the relationship between that knowledge and the data it produces, and the large-scale statistical data sets generated from it via a number of human, technological, systemic and mathematical processes. The statistical data sets were regarded as important because they were highly influential, being used as the basis for significant and far-reaching decisions about healthcare in the NHS. These decisions included policy-making, financial allocations, and allocations of services and other resources. This situation provided fertile ground for this research because the clinical knowledge and data were believed to be subjective to some unknown degree. The statistical data sets, however, were endowed with objective and scientific value. The thesis explores and explains this apparent contradiction.

In addressing this issue, the thesis encompasses philosophical, sociological and technological concerns and develops explanatory theories grounded in data collected. Data was collected by a process of extensive qualitative field-based investigation undertaken with clinicians, and data collectors, handlers and users in their operating environments. Key concepts underpinning these theories involve the social construction of reality as a product of individual and group frames of reference; social construction of reality as a result of social arrangements for professional groups; social construction of reality as a result of the pursuance of ontological security; and lastly, the phenomena of structural contradiction and conflict. Of major relevance in this was Giddens' work (1976, 1984) on Structuration Theory, in particular in terms of exploring the effects of sociologically-based frames of reference on creation and transfer of meaning in informational terms. This work was also influential in terms of the notion of structural contradiction and conflict and its informational effects.

Application of this abstract, meta-level theory to this real-world situation also led to one of the main contributions to theory. This engagement with reality enabled refinement of its underpinning model. It also demonstrated its explanatory power. This strengthens the validity of the theory and renders it more accessible to other researchers.

The thesis indicates clinicians' use of information and subsequent recording of data represents a highly personalised area of professional activity. This does not subsequently translate easily into the data sets and statistical classification schemes that are in common usage in healthcare management. These findings led to conclusions which confirmed initial perceptions of statistical clinical datasets as having a tenuous connection with the clinical knowledge and events upon which they purport to be based. Drawing on evidence which describes knowledge as being situationally-dependent, the conclusions also assert that the transformation of original meaning this implies is largely due to social influences. Finally they claim that the apparent rationality of decisions made on the basis of the transformed meaning, while the result of calculative thought designed to justify related decisions, is misguided in that it has no foundation in the evidence presented. The document ends with a call for a fundamental reassessment of the types of knowledge processed routinely through systems, and of the ways in which those types are handled.

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Chapter 1, Introduction to the Research

This chapter provides an introduction to the thesis. It contains an overview of the research problem. This is then expanded upon in a discussion of the researcher's relationship to the problem and the problem situation. This discussion also describes the reasons why the research was developed. The chapter goes on to describe the specific research questions designed to address the problem. Lastly, it discusses the broad approach taken to the research, and the rationale behind it.

This thesis describes a piece of research undertaken in order to better understand the nature of, and relationships between, certain kinds of knowledge, data and information. The context selected for this work was clinical practice in the UK National Health Service (NHS) beginning with the generation and use of clinical knowledge. The thesis undertakes a critical examination of the relationship between that knowledge and the data it produces, and the large-scale statistical data sets which are generated from it via a number of human, technological, systemic and mathematical processes. The statistical data sets were regarded as important because they are highly influential, being used as the basis for significant and far-reaching decisions about healthcare in the NHS. These decisions include policy-making, financial allocations, and allocations of services and other resources. This situation provided fertile ground for this research because the clinical knowledge and data were believed to be subjective to some unknown degree. The statistical data sets, however, are endowed with objective and scientific value. The thesis explores and explains this apparent contradiction.

In doing this, the thesis does not assert that quantification is invalid; as noted by Porter (1995) firstly quantification:

‘.... has an overwhelming appeal in Government, business and social research’ (Porter, 1995: viii)

As he then goes on to note, this is not least because it is:

‘.... a technology of distance it is well suited for communication that goes beyond the bounds of locality and community.’ (Porter, 1995: ix)

The need for pragmatic tools in an organisation as distended as the NHS is, therefore, accepted. However, as Porter (1995) goes on to note:

‘.... a highly disciplined discourse helps to produce knowledge independent of the particular people who make it.’ (Porter, 1995: ix)

This raises two issues. Firstly, acceptance of pragmatic need is not believed to preclude a requirement to understand the effects of those tools and associated processes, so that more informed use and provision of information might take place. Secondly, it is the exact nature of that ‘independence’ which is a key area for this research. Independence could be taken to mean that knowledge is easily transportable, that it is not anchored irretrievably in one location. This independence may also, however, underpin the apparent contradiction referred to above, by enabling unnoticed and unexplored change in the basic content and meaning of that knowledge. This issue is at the heart of this thesis and is explored by addressing philosophical, sociological and technological aspects of the problem domain.

1.1 Overview of the Research Problem

The research problem was based on the researcher’s perception of a paradox pertaining to clinical data in the NHS. The paradox involved the fact that the practice of medicine was socially accepted as being imbued with all the rigour and certainty of science. As noted by Higgs (1999) the history of medicine has:

‘ culminated in the dominance of ‘western scientific medicine.’ (Higgs, 1999: 162)

As also noted by Higgs, this is as opposed to any of the other highly complex systems of medicine which have flourished in other cultures for thousands of years.

However, as the researcher became involved with clinical knowledge and data, key elements of it began to emerge as being opinion-laden, uncertain and vague. In short, these elements seemed to be characterised by subjectivity at least as often as they were by objectivity. Yet both objective and subjective types of data were all regularly transformed into a homogeneous body of objective, statistical 'facts', which were the Government's national clinical datasets (known as Hospital Episode Statistics or HES data). Moreover, these 'facts' were being used by the Government and various healthcare managers as the basis of significant and far-reaching decisions about healthcare in the NHS. Herein lay the paradox, and the problem. Subjective knowledge, it appeared, was being objectivised as a matter of routine, and with far-reaching consequences. As noted by Felligi (1996):

'Given the magnitude of our problems, the leverage of the right kind of statistical information system has seldom been as great.' (Felligi, 1996: 166)

This comment was made in reference to the use of statistical information to inform national public policy in Canada. It was known to be equally relevant to the UK, where the national clinical datasets were used as follows:

- 'Policy development.
- Illustrating variations in health status and health delivery through time and across geographic areas.
- Providing answers to Parliamentary Questions (PQs).
- Production of comparative statistics to assist in performance management.
- Medical research – HES contains a wealth of information of use to clinicians and others who are developing new treatments, investigating causal factors and monitoring trends.
- Helping to determine how much of the taxpayers money should be spent on healthcare, and how it should be distributed.' (DH, 1997a: 1)

The problem perceived was clearly, therefore, hugely important in social terms. Given

such a situation, and an increasing reliance on such data, such confidence was considered to be misplaced without serious study of the underpinning knowledge and the data it generated.

1.2 The Background to the Research: The Researcher and the Research Problem

To expand upon the above overview, initial perception of the research problem began for the researcher during her first work assignment for the NHS. This required direct involvement with NHS clinical work and information at all stages of its generation and use. The researcher's assignment focused on the development of a statistical classification for clinical data. This tool, Healthcare Resource Groups (HRGs) is more fully described in chapters 2 and 8, although some description is useful at this stage.

Like all of the statutory NHS statistical clinical classifications, the primary purpose of HRGs was to provide statistical data to NHS managers. This was used as a basis for administrative decision-making about clinical work, both locally and nationally. A basic premise of its operation was that the system would only use clinical data already being collected in a management minimum dataset developed in the 1980s. This dataset was designed to give managers what were considered to be the minimum amount and type of data necessary for management decisions in running the NHS at all levels. The dataset was a mixture of basic demographic and clinical data about each patient encountering NHS hospitals. The demographic data was collected from the patients by administrative clerks. The clinical data was abstracted by coding clerks from statements recorded in medical casenotes by clinicians, and then processed through two clinical classifications, the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) and the Office of Population Censuses and Surveys Classification of Surgical Operations and Procedures, Fourth Revision (OPCS-4). It was also subjected to various statistical processes.

To this work of classification development the researcher brought the socially accepted view of the clinical world, its knowledge and data coming from it. In other words, clinical work was considered to be characterised by certainty and 'scientific' rigour. Data based upon it was, in principle, considered to be the same. It was, therefore, considered valid for the purposes of computer coding and statistics. This was despite the knowledge that, as noted by Krause and Clark (1993):

'Uncertainty pervades life and can arise from many sources. It is present in most tasks that require intelligent behaviour, such as planning, reasoning, problem-solving, decision-making and many others dealing with real world entities.'
(Krause and Clark, 1993: 1)

However, such was the socially-held perception of clinicians and their work that this was not perceived as applying there.

The researcher's involvement with healthcare data then extended as she became responsible at national level for development and maintenance of all statistical clinical classifications for the NHS. With the overview brought by this position it became clear that clinicians were generally unhappy with these classifications, particularly in terms of the way they represented their clinical work. It also became clear that managers, while believing that the data coming out of the classifications could accurately reflect clinical work, were generally unhappy with the quality of that data. It was obvious that something would have to be done if the classifications were to fulfil their allotted role and justify the investment made in them.

A review of what appeared to have been done up to that point indicated that action taken had entrenched the problem rather than resolved it. The researcher's opinion was that this was possibly because the views of neither group had been perceived as having any validity by the other. In a departure from this stalemate, one of the ways in which she sought, therefore, to resolve these difficulties was to seek better understanding of each group's worldview. This approach was adopted in the hope of managing the conflict and arriving at a negotiated plan of support for the classifications. This was undertaken

by close work, not only with managers, but also with clinicians, using a mixture of approaches. These were most noticeably characterised by their appropriateness to gaining understanding of conflicting views of the same issues, and included for instance, Checkland's Soft Systems Methodology (Checkland, 1981). This process is fully described in the researcher's Masters thesis (Drennan, 1991).

The results of these efforts were unexpected. Far from enabling development and use of classifications to move swiftly and directly forward on the basis of more shared understanding between the key groups, it precipitated for the researcher a sense of fundamental and significant unease about the basic premise of statistical clinical data classifications. It raised similar levels of anxiety about the validity of their data output and about decisions based upon that output. This unease had one main origin. The above-mentioned efforts to understand the realm of clinical work had necessitated fairly direct involvement with clinical knowledge, with its application, and with the generation of new knowledge and data. This changed the researcher's initial perception of clinical knowledge and data as being a homogeneous body of scientific, hard, objective, empirical fact. Rather it emerged as a mixture, with significant amounts of it being characterised by uncertainty and significant degrees of subjectivity and heterogeneity. That in itself was not considered to be necessarily problematic, because medicine seemed to work. Patients were treated and many seemed to get better. However, as mentioned above, this information was then, to varying degrees, used by the administrative management of the organisation as the key statistical and, it was assumed, factual descriptor of the conditions, treatments and clinical services received by NHS patients, and of the resources these incurred. Given these uses, and the coding and classification processes used to handle the data, the researcher's assumption was that management was routinely endowing all clinical data it received with scientific qualities. Inherent in the processing observed seemed to be an assumption by non-clinical groups (managers, statisticians, Ministers, coders) that the initial clinical knowledge was objective 'truth', and that individuals and systems involved were somehow neutral media in terms of the representations of reality they created. As a

result, impacts on the meaning of the original clinical data, or the integrity of the resulting statistics were not considered.

These insights immediately raised the possibility for the researcher of incompatibility between medical casenote data and ICD-10 and, to a lesser extent, OPCS-4. They also indicated that the original clinical statements written in the medical casenote were being transformed, not transferred. This led to two key questions for the researcher. The first was how such 'facts' could arise out of what seemed to be subjective opinion. The second was what the specific effects and implications of the transformation were for the resulting information. Both of these questions then quickly assumed a wider relevance, as they led the researcher to question 'objective' knowledge and information more generally, and to question its handling via systems.

1.3 The Aims of the Research and the Research Questions

The research focused, therefore, on what was considered to be an unexplored, fundamental and important trichotomy. This involved firstly, the nature of clinical phenomena, secondly, the nature of the knowledge and data generated by clinical phenomena and, thirdly, the nature of the uses to which that data was being put.

The research aimed to gain a deeper understanding of the nature of clinical phenomena, as expressed in the knowledge inherent in the key processes of clinical care. It also aimed to gain more profound insights into the primary and secondary data produced by those processes and the behaviour based on that. Exploration of this focused on the impact of social influences. These were deemed to be an important area to explore because it appeared, from the above situation, that different views of one reality might exist. In searching for reasons for this situation the researcher was conscious of a number of variances in the social, organisational settings involved. These included different professional and occupational groups: clinicians and managers, and different formal and informal information systems and requirements. This resulted, therefore, in

a focus being placed both on the nature of the knowledge, data and information in question, and on the settings within which they were found as knowledge and data were passed between groups.

This research was, therefore, based upon the premise that information is underpinned by knowledge and that knowledge sits within a social framework, which may have an effect upon it and upon the information it generates. Information in this context, was not, therefore, approached as a standard, homogeneous entity, static at all points in terms of its characteristics and its place within its context. Rather it was considered in terms of whether and how it was relative to and, most importantly, *reflective* of social context, whether it was a manifestation of that as well as a medium.

Because of the specific and more general problems the research could address, it aimed to contribute to knowledge underpinning both healthcare management, and theory and practice in the field of Information Systems (IS). This wider application of findings was based on the fact that data, information and knowledge underpin many other key social processes and phenomena, including the law, finance, and personal and corporate decisions. They can, therefore, shape the world in which we live, the reality we perceive and our ability to maintain and change that reality. It was hoped, for instance, to expand upon work which emphasises the need to understand the relationship between problem domains and systems analysis and development methodologies (Jayaratna, 1994; Checkland, 1981; Avison and Fitzgerald, 1995). This kind of contribution could be achieved by contributing to an underpinning foundation of detailed insight into the contexts which shape information rather than solely into what real-world entities information purports to describe and the nature of their existence.

Because the research would have the benefit of studying two extremes, in terms of the nature of knowledge and information, a further goal was to contribute to the continuing philosophical debate about the subjectivity or objectivity of reality. The intention was not to resolve this conflict between objectivist and subjectivist philosophies, and finally

determine whether anything actually exists independently of man's cognition of it. Nor was it to determine whether any absolute truths exist. As noted by Habermas (1972):

'If we imagine the philosophical discussion of the modern period as a judicial hearing, it would be deciding a single question: how is reliable knowledge possible.' (Habermas, 1972: 3)

However, what the research did seek to do was explore how a perception, or set of perceptions, became socially accepted as 'knowledge', in so far as they were received into and acted upon by a community. Validity therefore, in the context of this research, related to the relationship between the initial meanings with which this knowledge and associated data was endowed by its initiators, and the subsequent meanings attached by others.

The specific research questions that were developed in order achieve the aims of the research were as follows:

- Is there an objectivity inherent in clinical data?
- Can it be so readily translated into the body of statistical fact that underpins the data sets for healthcare decision-making?
- What is the relationship between the social knowledge processes involved in clinical decision-making and the nature of data produced from those actions?
- What is the impact on decision-making in healthcare management?

1.4 Overview of Approaches Used to Address the Research Problem

In broad terms the research addressed the problem in the following stages. Firstly, it considered the philosophical questions raised by research which sought to understand the nature of knowledge and social processes relating to that knowledge. Building on this foundation, it engaged in the bringing together of a view, comprised of initial and

relevant theories, from areas of conceptual work. This view was then tested through a process of field research, using NHS clinical data as a vehicle. Initial hypotheses were improved upon during this process. They were then ultimately refined in order to add to the existing academic knowledge base in this area. The results were also focused at providing advice of strategic and practical use to the Department of Health (DH) and other international healthcare bodies, which might inform policy making in the areas to which this knowledge would apply. This broad approach is reflected in the structure of the thesis, which can be represented diagrammatically as follows:

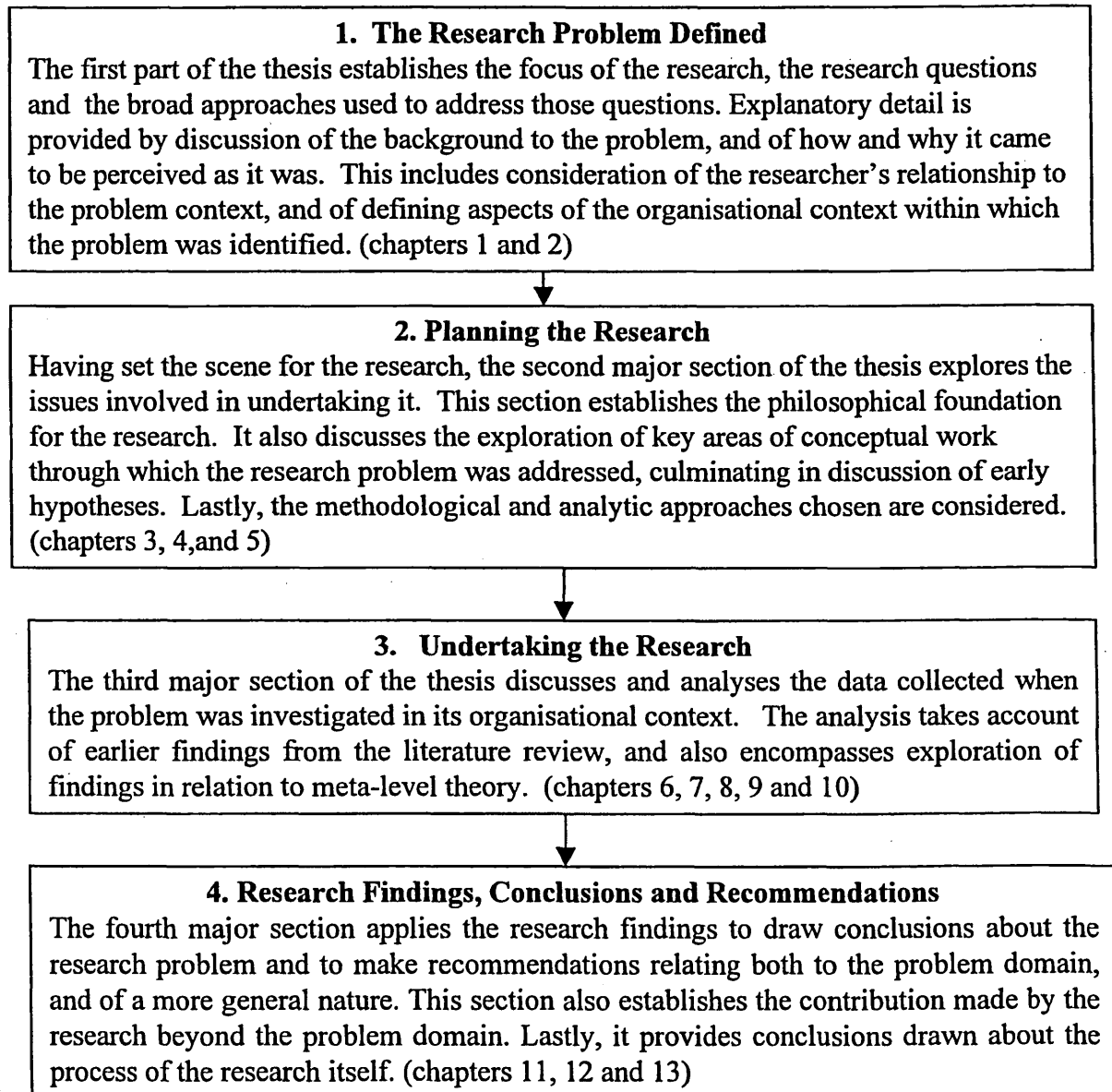


Figure 1: The Structure of the Thesis

Chapter 2, The Organisational Context

Due to the nature of the problem, it is felt that it is important at this early stage to set the context for the research. Context both informs and dictates our understanding of practices inherent in the research domain. In order to establish that contextual setting, this chapter provides a description and discussion of the NHS as an organisation. The NHS of today is very much a product of social arrangements for the practice and organisation of healthcare prevailing before its inception. The history of the NHS is, therefore, addressed, starting with the situation before its inception in 1948, and including significant developments since then up to the present day. This discussion also provides an insight to the foundations of current roles and relationships amongst key actors in the research problem domain.

The discussion then continues to build a picture of the problem domain by describing the information systems at work there. The relationships between them are described in terms of the clinical data which flowed from one to the other. The systems included the medical casenote, which was manually created by the clinician and was the source of all clinical data thereafter. They also included several systems which were then used to process extracts of the contents of the medical casenote. These systems were computers, a coded, computerised nomenclature, statistical classifications, and statistical processes. People were addressed as part of the literature review and as part of the fieldwork. Discussion of them is included in the relevant chapters. A detailed organisational analysis is also provided as part of the discussion of the literature.

2.1 Before the NHS

Prior to its inception the medical profession was divided into three distinct groups: General Practitioners (GPs) and two tiers of hospital doctors, each of which had very different terms and conditions of employment. Each GP was, for all practical purposes, an independent businessperson whose practice, for the most part, was quite separate from the hospital service. The hospital service was split into two distinct areas: voluntary and municipal. The most prestigious hospital doctors usually worked in the voluntary hospitals, which were mostly eighteenth century charities in origin and governed by a

board of trustees. These hospitals had no direct management. Their doctors did not, therefore, answer to a direct manager and to a large extent they managed themselves. They were in possession of enormous, independent power. This was based historically on the kind of expert and specialist knowledge that has made 'professional syndicalism' a feature of most, if not all, middle class professions.

The remaining hospital doctors worked at municipal hospitals. This was by far the larger of the two sectors. Local politicians controlled these hospitals at a macro level. At a local level they were controlled by a Medical Officer for Health who was, in effect, a doctor-manager. This person had great power, but within the constraints of direct management.

2.2 The Birth and Development of the NHS, 1948-1999

This was the situation into which the Government of 1948 introduced its proposals for a national health service. As noted by Cook (1987) its initial objectives were to:

‘..... provide good medical care for all, free at the point of need’ (Cook, 1987: 11)

It sought to do this by marshalling what were, at that time, uncoordinated and inequitably distributed medical services. This aim met with considerable resistance from the medical profession, not least because of the perceived loss of independence to which it might lead. Clearly, however, the involvement and support of clinicians were critical to the enterprise. Such was the Government's commitment that, in order to secure that support, the then Minister for Health, Aneurin Bevan, struck some key bargains. Most significantly he gave the medical professions concessions, the likes of which other professions could only dream. The effects of these concessions continue to reverberate through the NHS to the present day, particularly in the hospital sector. Specifically, what Bevan did was to review the existing municipal and voluntary models of management within healthcare. He then selected the voluntary sector model as part of the basis upon which Consultants would agree to support the NHS. He thereby extended the privileges previously enjoyed only by the elite of the medical profession to all those working in the hospital sector. Thus no hospital and, critically, no doctor had a manager. Furthermore,

while receiving a salary from the NHS, doctors were allowed to dictate their own terms as to when and how they would work within it.

Thus, the expert power of clinicians persisted. No 'outsider' possessed the competence to judge practice, and no insider needed to, because practice was evidence of expertise, and expertise was a matter of judgement as well as skill. They continued to be nominally equal, fiercely independent and self-managing. Their actions, practices and general modus operandi, including production and provision of information, remained largely uncontrolled and uncontrollable by outsiders. The loyalty of the profession was, and remained, firmly and exclusively focused towards its patients, its members and its professional bodies. The latter was also the profession's greatest and, for all practical purposes, only real source of both sanction and censure. The profession essentially, therefore, retained all of the power it previously held, in terms of autonomy, etc., and supplemented that with access to a pool of resources and a source of regular and guaranteed income.

This was largely the situation when the research was undertaken, the only potentially relevant development being the Internal Market.

2.3 The Internal Market and the Research Problem

The development of the Internal Market in healthcare in the 1990's is worth consideration in terms of the situation which led to it. This is useful in order to fully appreciate the implications of the change for information within the NHS and, therefore, for the research problem.

When the NHS came into being hospitals were funded centrally from Government coffers. Allocations were made annually and were calculated on the basis of what each hospital received the previous year together with an allowance for inflation where appropriate. GPs continued to be small-scale, largely independent businessmen. Central management of General Practice was largely nominal and quite separate from the structures agreed for the hospital sector. However, funding did change, as GPs became contractors to the NHS, receiving a capitation fee for each patient on their list.

This all changed again with the advent of the 'Internal Market'. In the face of increasing demand for static or, in real terms, diminishing resources, every Government has espoused the view that the efficiency and effectiveness of the NHS must improve. However, the last Conservative administration also took the view that the traditional method of guaranteed annual funding offered insufficient incentive for this to happen. As a response to this the Internal Market was introduced.

This was a system which was being maintained by the Labour Government during the research, although the December 1997 White Paper, 'The New NHS: Modern, Dependable' (DH, 1997b) expressed an intention to modify it from 1999. The essence of the system was that, ultimately, hospitals would not receive any funding from central sources. This was being phased out so that during the research most hospitals still received a proportion of their funding in this way. Competitive packaging and marketing of healthcare services to GPs would acquire the remainder of the funding. GPs were provided with budgets from central funds to disburse on patient care, theoretically at least, anywhere within the NHS. They could also employ private practitioners where it could be justified. So, for example, a GP might traditionally have always sent hip replacement patients to the nearest local hospital. However, in the Internal Market, another hospital might convince the GP that their care was equally or more effective and cheaper. This persuasion could be achieved by use of local data, for instance, about shorter lengths of stay in hospital for given treatments or conditions, and low rates of readmission. The GP would be at liberty to send that work to the new hospital, which would then be appropriately reimbursed for the care delivered. Alternatively, or additionally, the GP might underpin any decisions of this nature by reference to published DH statistics.

With the Internal Market money, therefore, began to follow patients rather than being a guaranteed factor in the operational life of a hospital. Hospitals that failed to achieve funding could, therefore, be closed, and demonstrable quality of care, as described by clinical data, was among the deciding factors. It seemed likely, therefore, that clinical activity, judgements and decisions, as reported in clinical data, as well as in actual practice, would be liable to regular and incisive scrutiny. This in turn meant that the autonomy of clinicians as individuals and as groups would be vulnerable to challenge.

In a different but equally significant way the activities of managers in the NHS was also affected by this changed operating environment. Managers, specifically Chief Executives of NHS hospitals, became responsible for the financial health of their organisations. This resulted in a much keener interest in the effectiveness and efficiency of clinical decisions than ever before. It was supposed by the researcher that this would partially manifest itself in a keen interest in clinical data.

The context of the problem was, therefore, one of deeply entrenched and significant structures and roles, but one in which change that had relevance for the research problem might be occurring.

2.4 NHS Systems and The Flow of Clinical Information

The remaining key elements of the context in which the research was undertaken were the information systems and flows. Because it is intended at this stage simply to provide a complete picture of the context, this section is largely confined to description and discussion of the systems' external specifications and design purposes. This is followed by a description of the processes that linked them and the flow of clinical data through the NHS. This is, therefore, a first level analysis of them. Deeper explorations of systems types and of the specific systems at issue were undertaken later in the research, during the literature review and field research. They are, therefore, analysed in greater depth in the reports of those parts of the research.

Six clinical information systems formed the vehicle for this research. The first was the medical casenote. This was the key data source for the other systems. The first of these was the hospital Patient Administration System (PAS). The remainder were the Read Coded Clinical Thesaurus, Version 3 (Read 3) ICD-10, OPCS-4 and HRGs. PAS, Read 3, and HRGs were all computerised systems. ICD-10 and OPCS-4 were either manual or software-based. In either event data compiled using them was always entered into a computer. Together with their organisational context these systems formed the backbone of clinical knowledge and data transfer within the NHS.

2.4.1 The Medical Casenote

Each NHS hospital patient has a medical casenote. This is a file containing administrative details, for example demographic information, and a clinical sheet or document produced or added to solely by the clinician as a result of patient encounters. From the clinical perspective it appeared that the purpose of this document was as an action log. In other words, it was a document written by clinicians for clinicians, that was oriented possibly towards future action on the patient, possibly towards defence of past clinical action and opinion. It was used by the NHS as the main source of all clinical data for management purposes.

2.4.2 Patient Administration Systems (PAS)

PASs are modular information systems installed on hospital mainframe computers. Coders used these systems in order to complete their task. Access by coders to administrative and clinical coding modules was through remote terminals, linked to the central hospital databases. PASs were designed initially to collect patient administration data for local use and in order to fulfil statutory requirements for returns of data to the DH. With the addition of subsequent modules a variety of patient information could be collected and processed for a number of different users. This included clinical data of the type focused on by this research. All PASs offer users a number of field-based screens that are relevant to the particular module being accessed, the basic contents of which did not vary across the NHS.

2.4.3 The Read Coded Clinical Thesaurus, Version 3 (Read 3)

Read 3 is a computerised system of coded clinical terms. It was developed by and for clinicians to support them in the delivery of patient care. The importance of this system to the research was that, while it was not possible to collect primary data reflecting its live use, it was increasingly used within the NHS to record computerised details of clinical consultations, and reflected the most recent direction and views of the DH on clinical data. It was also increasingly used as the basis from which statutory data and, therefore, statistical datasets were derived. In practice, although the intention was that

clinicians should enter their own data using this system, where it was used clinicians usually still completed medical casenotes as they always had, and these still went to coders. The coders then entered the data into the PAS by first using Read 3. They then achieved classification data through a mixture of manual work and automatic maps from Read 3 to ICD-10 and OPCS-4.

This system purports to move away from the inherent scientism of clinical classifications. It is, like all representational systems, a model of a view of the clinical domain, as it relates to both primary and secondary healthcare sectors. In terms of the detail of the model, it can be described as a concept-based systematised nomenclature. In other words, it is a system of terms which is elaborated according to pre-existing rules and has a concept system as its basic principle of organisation. Concepts are assumed to be non-linguistic abstract entities that are expressed by linguistic terms. Read 3 contains hundreds of thousands of clinical terms, catalogued by clinicians, and reflecting the words they normally use to describe their clinical work in the everyday care of patients. Types of data analysis to be undertaken were not specified at the design stage, beyond ensuring each clinical user could retrieve their own data as entered. Rules for use do not exist, and definitions of terms do not exist. To this extent Read 3 does not impose a framework.

The terms are arranged in a hierarchical file structure and each term has its own unique alphanumeric code. The code identifies the term and nothing else. It carries, for instance, no information about the place of the term in the conceptual hierarchy within which it sits.

The hierarchy closely mirrors the current bureaucratised approach to medicine, which starts with 'disease' or 'treatment' and divides the body into parts. Thus the top 'chapter' in the system is 'Read thesaurus'. Beneath this are the chapter headings, which are fully listed and described in Appendix 1. They include, for instance, History and Observations, Disorders, and Investigations. Beneath each heading are relevant terms. So, for instance, beneath History and Observations are terms for clinical findings, which the literature says may be obtained from a clinical history, examination, assessment, special investigation or tests.

This structure has knock-on effects for the ‘logical’ arrangement of some concepts within the system. A concept such as ‘pulmonary tuberculosis’ must appear twice, in both the ‘Respiratory Disorder’ and the ‘Infective Disorder’ hierarchies. A further feature of the system is that, in order to avoid a ‘term explosion’ and because of the area of the world it is addressing, Read 3 breaks ‘complex’ terms into what are known as ‘core terms’ and ‘qualifiers’. Therefore, ‘Emergency Appendectomy’ would appear as a core term of ‘Appendectomy’, with an option of selecting ‘Emergency’ from the available qualifiers. The grounds for deciding what is a core term and what is a qualifier seemed somewhat arbitrary.

Core terms are supplemented by synonyms, each also with their own unique code, but inextricably linked to their associated core term within the system. The criteria for deciding what was an acceptable core term or synonym was also somewhat arbitrary. Being in normal use by a number of clinicians seemed to be the most common criteria.

As mentioned above, the system holds no definitions of terms. Users are free to work with the terms in the contexts of their own frames of reference. The system gives no advice on what aspects of observed facts and medical language data should be reported or how it should be indexed. It just offers concepts (terms) for standardising medical language data in what was considered by the designers to be a passive manner, although this passivity is somewhat tempered by the existence within the system of established clinical relationships between entities. These relationships, however, broadly reflect clinical consensus, being based upon established texts and teachings in the field. In terms of definitions of clinical concepts and entities it is assumed that, at one level, users will apply their own definitions and meanings to the terms in the model. At another level it is hoped that groups will see the benefit to clinical care of being able to share clinical information about patients, and will be driven to agreeing and establishing definitions.

2.4.4 The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10)

The importance of this system to the research was that it was one of the two systems mandated by the DH within the NHS for use in production of statutory datasets. Every

patient encountering the NHS must have defined clinical details coded according to one of these systems. As described above, this is either done manually using the medical casenote and the classification manuals or, where Read 3 was used as a front end, the codes in this classification were reached by means of mapping tables and some manual work. The differences in the levels of detail between these systems, which becomes more evident below, inevitably impact upon the original clinical data.

As its title suggests this is a statistical classification, i.e. an arrangement of concepts into classes and their subdivisions, expressing the semantic relationships between them. The criteria for subdivision are clear, and the division is exhaustive and exclusive. The characteristics used for subdivision reflect its purpose. It works, therefore, in a top-down, goal-oriented manner. In a statistical classification class frequencies do not differ too much from an equal distribution in some sort of reference population. Cote (1983) maintained that, in this sense, the ICD is not truly a statistical classification. Here the term 'statistical classification' should be defined as lists of statistically significant entities based predominantly on prevalence or considered importance.

ICD is produced and maintained by the World Health Organisation (WHO). The WHO (1993) defines its purpose as being:

'.... to permit the systematic recording, analysis, interpretation and comparison of mortality and morbidity data collected in different countries or areas and at different times.' (WHO, 1993: 2)

As noted by Porter (1995):

'.... quantification is a technology of distance'. (Porter, 1995: ix)

Its classes are arranged so as to facilitate the statistical study of disease phenomena. It is used to translate diagnoses of diseases and other health problems into alphanumeric codes, which permit easy storage, retrieval and analysis of the data. It is the international standard diagnostic classification for all general epidemiological and many health management purposes. These include analysis of the general health situation of population groups. They also include monitoring of the incidence and prevalence of diseases and other health problems in relation to other variables, such as the

characteristics and circumstances of the individuals affected. The WHO makes it clear that the ICD is neither intended nor suitable for indexing of distinct clinical entities. It is, however, routinely used in the NHS in this way. It also warns of some constraints on its use in billing or resource allocation, such as that engaged in by users of HRGs, which draw their data from ICD-10 and OPCS-4 data.

It was originally designed to classify causes of mortality as recorded on registration of death certificates. Its use and scope was only more latterly extended to include morbidity. The developers recognised that not every problem or reason for coming into contact with health services can be categorised as a disease or injury with a formal diagnosis. It also provides, therefore, a wide variety of signs, symptoms, abnormal findings, complaints and social circumstances that may take the place of a diagnosis in health records. Interestingly, NHS checks on the quality of ICD-10 data prohibit more than minimal use of these. Non-specific statements are deemed by DH statisticians to exist in medical casenotes only rarely.

ICD-10 can be used to classify data recorded under headings such as ‘diagnosis’, ‘reason for admission’, ‘condition treated’, and ‘reason for consultation,’ all of which appear on the variety of health records from which statistics and other health-situation information are derived.

The ICD-10 classification is organised into hierarchical chapters, again reflective of the bureaucratic approach medicine takes. These are fully listed in Appendix 2. They include, for instance, Diseases of the Blood and Blood-Forming Organs and Certain Disorders Involving the Immune Mechanism; Congenital Malformations; Deformation and Chromosomal Abnormalities; Injury, Poisoning and certain other consequences of External Causes; Diseases of the Nervous System; Diseases of the Musculo-Skeletal System and Connective Tissues; and Symptoms, Signs and Abnormal Clinical Findings Not Elsewhere Classified.

The ICD is a variable-axis classification. The following pattern of organisation can be identified within its structure:

Epidemic diseases
Constitutional or general diseases
Local diseases arranged by site
Developmental diseases
Injuries

The first two and the last two of the groups listed above comprise 'special' categories, which bring together conditions that would be inconveniently arranged for epidemiological purposes if they were scattered. The remaining group includes the ICD chapters for each of the main body systems. The WHO (1993) warn that:

'.... the distinction between the 'special groups' chapters and the 'body systems' chapters has practical implications for understanding the structure of the classification, for coding to it and for interpreting statistics based on it.' (WHO, 1993: 13)

They advise that generally, and where there is any doubt, conditions should be primarily classified to one of the special groups chapters.

Though the WHO admits the arbitrary nature of some of the characteristics of the ICD, they maintain that it has stood the test of time and is found to be a more useful structure for general epidemiological purposes than any of the others tested.

The basic ICD is a single coded list of three character categories, each of which can be divided up into ten four character sub-categories. Alphanumeric codes are used. Possible code numbers range from A00.0 to Z99.9. The letter 'U' is not used, being reserved for research purposes.

The classification has a limited number of explicit definitions relating to certain terms: e.g. 'live birth'. As is customary for a classification, it also has extensive rules governing what can be assigned to any class. These are deemed essential in order to produce 'comparative' information as they guarantee unique assignments of individuals' instances or concepts to one class. Class frequencies could not be interpreted statistically if this were not the case. The classification contains over 40,000 coded labels.

2.4.5 The Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures, Fourth Revision (OPCS-4)

This is the other mandated system for producing statutory data about NHS patients. This is a classification used for statistical purposes, although investigations to date do not indicate that statistics were the primary motive behind its design.

Its basic structure again follows the bureaucratic approach to medicine, with 23 anatomically-based chapters, most of which relate to procedures on the whole or part of a body system, e.g. Nervous System; Endocrine system and Breast; Eye; Ear; Respiratory Tract; etc. They follow the same principles as ICD-10 and are not, therefore, listed in an Appendix to this thesis.

Alphanumeric codes are used in a hierarchical structure. The authors maintain that:

‘.... strict anatomical allocation of operations has infused a readily understandable logic into the classification.’ (HMSO, 1990: viii)

This is interestingly described as necessary:

‘.... given the increased blurring of specialty boundaries.’ (HMSO, 1990: viii)

The classification contains over 10,000 coded labels.

Within each section procedures were generally sequenced in a way which was thought to reflect their comparative significance in resource use terms. This was done by arranging the procedures within each organ section in descending order of complexity, as understood in 1990. Notably this was before the emergence of ‘keyhole’ surgery as a main technique in surgery.

Like ICD-10, it contains some limited definitions, e.g. what constitutes a surgical procedure. It also contains limited instructions to coders regarding what should be assigned to the classes.

2.4.6 The Healthcare Resource (Statistical) Grouper (HRGs)

As with Read 3, it was not possible to collect primary data about the live use of this system. Once again, it is included for completeness.

At the time of the research this system was mandated for use in developing financial contracts for the sale and purchase of healthcare in some specialties within the NHS.

This statistical classification was designed for analysis of resource use in healthcare. It contains over 500 classes or groups. The system automatically draws its data from data classified using ICD-10 and OPCS-4 via a series of mapping tables. It implicitly follows the organising principles of ICD-10 and OPCS-4, although groups are labelled according to their HRG content as would be expected. Groups are not individually listed here due to their number. They are designed to contain disorders and treatments that have similarities, in that clinically they can be meaningfully grouped together and are also expected to consume similar amounts of healthcare resources. Thus they include, for example, groups titled Non-Surgical Treatment of Fibroids, Menstrual Disorders or Endometriosis; Spinal Cord Injury with Fusion or Depression; Complex Elderly with a Vascular System Primary Diagnosis; and Neonates with Multiple Major Diagnoses. Each group has an alphanumeric code.

2.4.7 NHS Clinical Data Flows

The following logical model is designed to show how the systems work together:

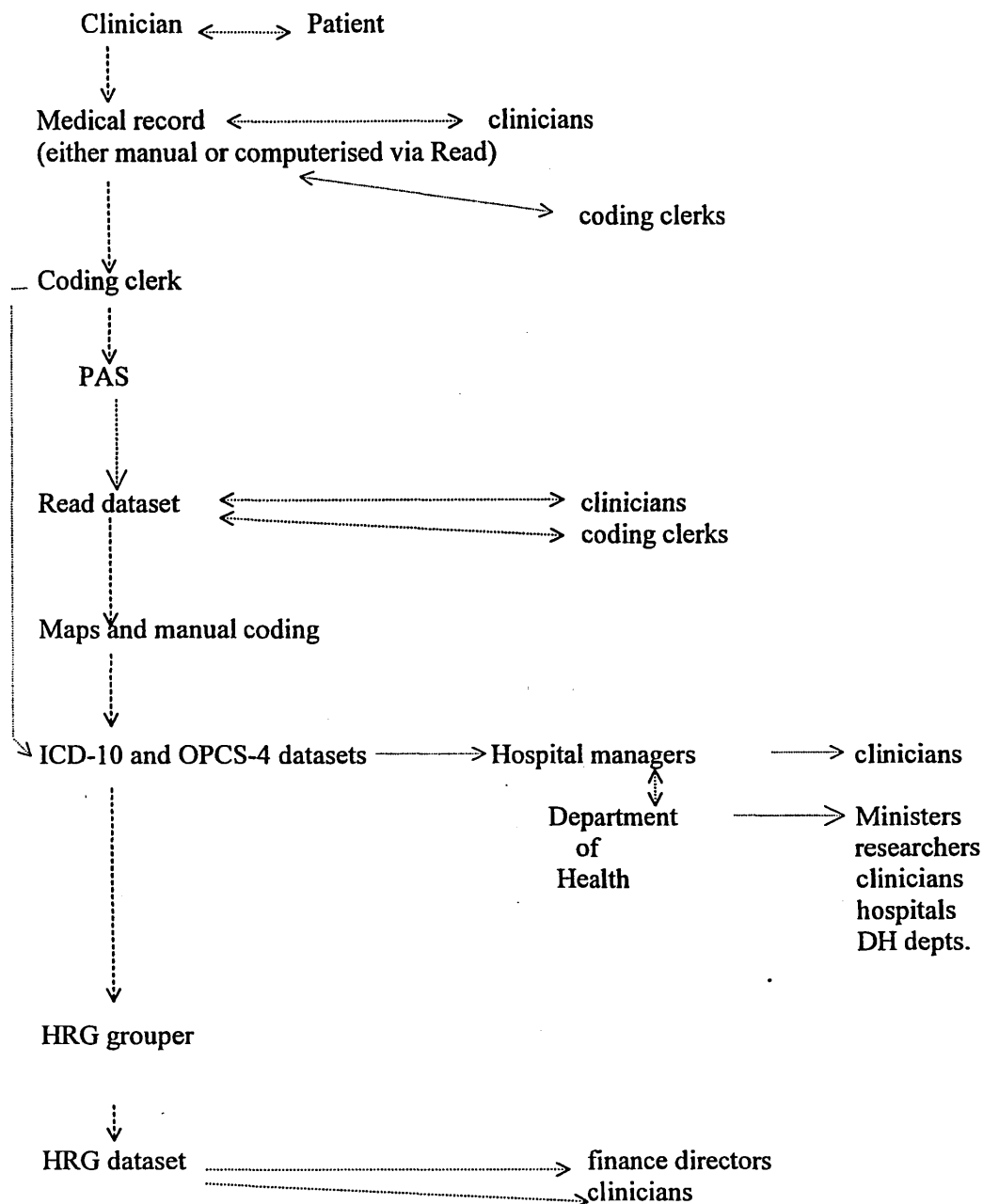


Figure 2, Macro Information System Flows

In the above model the flow of data through the systems progresses down the left-hand side. The right-hand side of the model describes those to whom the data is available.

Following the left side, clinicians engage in consultations with patients and produce from that a document, described here as the medical casenote. This is either solely in manual format or also in computerised format in Read 3. This captures those details

clinicians deem relevant to patient care. The form and content of the medical casenotes can be idiosyncratic and incomplete. They can be composed of any of the following: clinical statements and observations, speculations, symbols, drawings, printouts, and numbers. As well as describing treatments, these often refer to illnesses, symptoms and conditions. They do not always contain, therefore, definitive diagnoses.

This data is then passed, either electronically or using the medical casenote, to coding clerks so that the clinical details of the consultation can be coded. The coding clerks do this by first accessing the patient's administrative record, which is held on the PAS. This enables them to check, for instance, that they are coding the right patient. They then access the clinical coding module and enter the details of the patient's condition(s) and treatment(s) if relevant. Certain data items from this collection are then manually abstracted from the medical casenote. They are then codified. Two alternatives are available for this initial coding process. They could be coded initially using Read 3. These codes would then be translated into their classification equivalents, using a mixture of manual coding and mapping tables. The mapping tables are software-based and contain the relationships between each thesaurus code and its classification equivalent(s). Alternatively, clinical data could be coded directly into ICD-10 and OPCS-4. This process would produce the ICD-10 and OPCS-4 statutory datasets used by hospitals and required by the DH and made available to its customers. Where Read was used it would also produce a Read database for use by the hospital.

ICD-10 and OPCS-4 coding is then sometimes followed by coding into the higher level classification, HRGs, using fully automated mapping schemes. This reclassifies the original coding in a different way for the purposes of analysing resource use in healthcare. It also produces an HRG dataset for use by the hospital.

In the problem domain, coding and classification was happening, therefore, more than once, and using various people and mechanisms, both manual and computerised, each with different design purposes. The data was then subjected to statistical analysis in hospital information departments and DH statistical departments. These efforts ultimately produced reports in basic numerical formats, which were variously presented and widely used as definitive *facts* about the real-world clinical phenomena described. Entire

publications were found to be devoted to them (DH, 1998a, 1998b). Subsequently, far-reaching decisions, as described in chapter 1, were made on the basis of them.

Chapter 3 Addressing the Problem: Philosophical Considerations

3.1 Introduction

This chapter describes the philosophical issues which were addressed when starting to explore the research problem. Specifically, it describes how the researcher defined the problem situation in terms of key factors at work. It then explores the philosophical stance adopted by the researcher and seeks to make an argument for an open-mindedness amounting to a multi-view approach, particularly during the early stages. It also explores how that influenced definition of perceptions of the problem situation and the research problem itself. As noted by Popper (1957) the best we can do is write in a way which is consistent with a particular point of view, and that point of view ought to be clearly stated. The chapter also provides the rationale for the areas of theoretical work explored, which will be seen to span the philosophical divide of subjectivity and objectivity. Lastly, it provides the foundation for the approaches used in the field work stage of the project. As noted by Kirsch (1983):

‘ Perhaps the most obvious way philosophy can contribute to the human sciences is by questioning underlying methodological principles.’ (Kirsch, 1983:12)

3.2 Philosophy and the Researcher: Defining the Problem Situation

The research problem was perceived as encompassing both social and scientific elements. It was considered necessary, therefore, to examine relevant elements of social context and the scientific treatment of the information. These included the generation of clinical knowledge and the movement, manipulation and multiple uses of the data and information that generated. Information in this context was not perceived as innocent (March and Simon, 1958) or as existing in a vacuum. Rather it was seen as the lifeblood of the organisation and inextricably bound up with its goals, politics and practices. Thus the research included exploration of the organisational context of the research problem. This followed Kantrow’s (1984) assertion that:

‘In order to know which design changes are really needed, it is first necessary to understand how various systems and structures fit and work together, what is the logic that holds them, what special peculiarities and relationships are essential, what constraints are unavoidable.’ (Kantrow, 1984: 41)

Thus, it was deemed relevant to this research that, as previously described, the NHS as an organisation was the product of an ‘agreement’ between the Government and the British medical profession in 1948. The nature of that agreement was of interest in terms of whether and how the consequently political character of the NHS might affect the research problem. In addition, the main objective of the Government in 1948 had apparently been, and ostensibly still was, to develop an organisation wherein the best medical care for all, free at the point of need, would be available. The core business would be patient care and the primary need to be satisfied would be that of the patient. The NHS was undeniably, therefore, the product of a particular political ideology which, it could be argued, was based on a belief that the State knows what is best for its people, and which forever placed the NHS firmly within the realm of public ‘ownership’ and political utility. This, in turn, characterised the demands to which non-clinical managers of the NHS would have to respond. These included, most significantly, that of public accountability, and methods of achieving and demonstrating that through information. Given that, account was taken of the work, for instance, of Barnes (1974, 1977) who considered such ideologically grounded knowledge as inherently including and concealing illegitimate interests. This was particularly interesting in terms of the NHS. As discussed by Mannheim (1970):

‘The higher the rank of an occupation, the more likely its is to have a highly developed occupational ideology.’ (Mannheim, 1970: 438)

Drawing on Barnes (1974, 1977) this situation of robust ideological affinities might lead to consideration by the groups involved, whether implicit or explicit, of such questions as:

‘What account of reality would lead others to act so that instead of furthering their own interests....they furthered ours?’ (Barnes, 1977: 32)

Within this research, the extent to which this was so was particularly important from the perspective of understanding whether, when and where particular interests gained supremacy and what the ensuing effects were on knowledge gained and transferred.

It was also considered to be of relevance to examine the situation prior to inception of the NHS because medical models, power bases and relationships existing at that time were carried forward into the new NHS structure and persisted, in large part, to the period of the research. Thus, a focus was also placed on understanding whether the professional nature of clinical work had a bearing on the research problem. A key element of professional autonomy, which is discussed at greater length later in this thesis, is what might be termed ‘knowledge closure’ by professions, using various means, including language and other methods of communication. In other words, professionalism and its inherent autonomy both enable and are enabled by communication arrangements which are exclusive of non-members. This raised concerns about the validity of such knowledge and information when employed outside the direct clinical context.

Thus, clinical imperatives and public ownership, ideological derivation and political utility were considered to be worthwhile areas of study because of their potential influence on knowledge processing and use. The underpinning question revolved around the relativistic perception that, as noted by Urmson and Ree (1995):

‘What is true in one situation may not be true in another that the concepts used in one situation may be unintelligible in another’ (Urmson and Ree, 1995: 275)

An important tenet of this approach for this research, as Urmson and Ree go on to discuss, was that it does not assume that different things are believed or said or done in different circumstances, but that it is possible that differences which emerge are a consequence of local circumstances. Thus this approach was considered to have

potential in explaining a situation where apparently subjective opinions emerged, after passage through a series of social circumstances and events, as 'objective facts'.

Moving down a level into the processes of the organisation, the information in question passed through a number of handling centres, involving people, hardware, software and manual systems. Each of these would, therefore, also receive attention.

The above description of the key factors at work in the problem domain represents the researcher's perception of some part of 'reality', namely the people, technology, structures, tasks and processes associated with the generation and use of specific sets of NHS clinical knowledge, data and information. This is a wide scope, and reflects two factors. Firstly, it reflects the researcher's previous exposure to all parts of the process involved in the research problem, which indicated the need for such a focus. Secondly, it reflects the researcher's belief that the context of the problem was organisational and that an organisation is not a machine, but what Checkland (1981:14) describes as a 'human activity system'. In other words, the context involves a dynamic, complex and purposeful system of social relationships, including people, technology, structures, tasks and processes (taken from Jayaratna's (1994: 59) modification of Leavitt's (1972) model). This was not to discard notions of scientific mechanism, but rather to widen the method of enquiry sufficiently to ensure that both those concepts and humanistic, interpretive notions could be accommodated. A focus on all of the elements was deemed necessary to generating explanatory hypotheses.

The word 'deemed' is important, because the early stages of the research were intended to produce hypotheses which would later be tested and developed. The desire here was to ensure that, while not extending to random explorations, the scope did not exclude potentially important areas at an early stage.

The views and approaches described thus far are not the only possible views and approaches. As noted by Jayaratna (1994):

‘....problem solvers, by being human, tend to select some elements of the situation as being relevant and useful for study...’ (Jayaratna, 1994: 64)

As he goes on to note, sometimes this selection is unconscious and based on unexamined assumptions, and sometimes it is based on explicit models and methodologies that are employed, although the author would argue that both assumptions and methodologies can be mutually influential. What is clear, however, is that individuals approach and understand situations via a cognitive framework or ‘mental construct’ (Jayaratna, 1994: 64). This can vary from individual to individual and have influential effects on what is perceived and how.

Among the characteristics active in influencing a researcher’s choices, Jayaratna (1994) goes on to identify such factors as the researcher’s perceptual process, which filters information from the real world and determines significance. He identifies values or beliefs assimilated from various societal sources, like peer groups and parents, and guiding choices between alternatives by helping individuals to pass judgement on situations, etc. He also includes ethics or expected standards and types of behaviour; motives, or needs individuals seek to satisfy; prejudices, or persistent opinions; experiences; reasoning ability and knowledge and skills. He further includes role characteristics, i.e. those that are assumed as part of holding responsibility for particular tasks. Lastly, he includes structuring processes or ways of structuring our thinking, whether or not we have access to methodologies, models and frameworks. Frameworks are described in this context as static structures which show the connections between a set of models. Jayaratna argues that the elements of this mental construct act together in a dynamic way in the process of enabling individuals to make sense of and negotiate reality.

The elements deemed at this stage to lie within the initial boundary of the problem situation inevitably, therefore, reflected the characteristics of the researcher. However, it is argued that awareness of these influences resulted in a more comprehensive and useful boundary than would otherwise have been the case.

3.2.1 Worldviews and Their Validity

Fundamental to the mental construct described above are our beliefs about the nature of reality itself and our consequent beliefs on investigating it. The concepts of 'subjectivity' and 'objectivity', and of scientific and interpretive approaches to reality are significant here. Development and justification of an approach to exploring this problem clearly involved a need to explicitly clarify, first of all, what these positions meant to the researcher. The following tables, which draw on unpublished work by D'Arcy (1989) sought to do this and to create a foundation for the rationale behind the initial and subsequent approach used in this research. This approach is developed further later in the thesis, when research methods in connection with fieldwork are described and the role of the researcher in this regard is fully explored.

The framework distinguishes philosophically between the scientific and interpretive paradigms by means of laying out what are considered to be the key parametric characteristics of a paradigm. The term paradigm is used here to represent a commonality of perspective which binds the work of a group of theorists together in such a way that they can usefully be regarded as approaching *social* theory within the bounds of the same problematic. Each paradigm, therefore, has an underlying unity in terms of its basic, and often taken for granted, assumptions. In a very fundamental way these separate theorists located in one paradigm from those in another.

Within the framework each parameter is described, firstly from the perspective of the scientific paradigm, and then from that of the interpretivist paradigm. The paradigmatical parameters of each are then described from the standpoint of the other. Each parameter is shown to represent a measure which, when applied to the scientific paradigm gives a particular response and when applied to something else, in this case the interpretive paradigm, gives another, thereby highlighting the key assumptions and differences inherent in both stances. The purpose here is not to focus effort on the still unresolved debate about any given type of reality. Rather it is to demonstrate that each

has strengths and weaknesses in relation to a particular worldview, and ultimately to show those strengths and weaknesses in relation to understanding particular types of phenomena. The first table describes the parameters of the scientific paradigm as seen from the perspective of the scientist:

PARAMETER	SCIENTIFIC PARADIGM
ontological commitment	external, common, knowable reality
method of enquiry	formal, logical, a priori analytic, a posteriori synthetic
nature of evidence	open to examination, proof and refute
nature of knowledge	shared, useful, applicable
purpose of knowledge	prescriptive, predictive
terminology (language)	precise, syntactically correct
relationship of user	maintained independence and objectivity from area of enquiry
development continuum (by following that paradigm)	gradual transitions, discontinuities due only to imperfect knowledge

Table 1, The Scientific Paradigm

Applying these principles to the realm of clinical reality, the key assumption is that of a reality which is external to man and knowable by him. All other parameters may be seen to be logical according to this foundation. That reality is considered, therefore, to be knowable by man by use of the kind of investigative approaches this stance embraces. The question then arose of whether this could be held, at this stage, to be true in terms of the clinical realm. Government approaches to that realm, i.e. statistics, codification, classification, etc., indicated it could be.

However, this approach has two other major characteristics. Firstly, it rejects notions of experiential realities which are unique to individuals. Thus, the role of the clinician as investigator into that reality would be perceived as being independent of it. This would mean that clinicians must be a neutral medium in terms of the representations of reality which they made. The researcher's professional experiences indicated this was not the case, although management actions indicated it was. Also, if the 'user' referred to above was completely independent of the object of enquiry, how would this paradigm explain its notion that discontinuities are due to imperfect knowledge? Knowledge resides within the individual and there is, therefore, an undeniable human influence at work.

Turning now to the interpretivist approach, the following table describes the above paradigmatical parameters applied to the interpretivist position:

PARAMETER	INTERPRETIVE PARADIGM
ontological commitment	essence of realities
method of enquiry	intentional perception
nature of evidence	derivable, non-replicable
nature of knowledge	interpretively descriptive of reality
purpose of knowledge	enhanced understanding of realities
terminology	flexible, adaptive (because it is impossible to predict the kind of realities we will encounter)
relationship of user	dependent on encountered phenomena
development continuum following that paradigm)	relies on alternatives and inherent discontinuities (by (if there were none the need for this paradigm would disappear)

Table 2, The Interpretive Paradigm

The basis of this philosophical stance is that reality is relative to the individual's perception of it. It cannot, therefore, be conceptualized as commonly knowable entities with regular relationships between them. This is a very different perspective, reflected in the work for instance of Barnes (1974) who asserts that all knowledge claims exist in the form we know them:

‘.... as a response to particular interests in prediction and control, which are in turn related to social interests.’ (Barnes, 1974: 30)

For the research problem it would imply that the clinician was influential and that known clinical reality was not a concrete phenomena. If that was the case nothing could ever be known with certainty, and if that was the case the question was raised as to how medical effectiveness, e.g. in treating heart disease, could ever be explained.

Each of these positions assumes an exclusive connection with the ‘absolute truth’. To elaborate further upon this it is useful to consider the views of each paradigm on the other, as shown in the following two tables. The first table repeats the assertions of the scientific paradigm with regard to the characteristics of its own parametric values, but also lays this alongside the scientific view of the interpretivist stance on the same parameters:

PARAMETER	SCIENTIFIC PARADIGM	INTERPRETIVE PARADIGM
ontological commitment	external, common, knowable reality	mystical, ambiguous reality
method of enquiry	formal, logical, a priori analytic, a posteriori synthetic	random, unstable
nature of evidence	open to examination, proof and refute	fragmentary, beyond proof
nature of knowledge	shared, useful, applicable	not supportable, opinion only
purpose of knowledge	prescriptive, predictive	confusing, arbitrary
terminology (language)	precise, syntactically correct	undisciplined
relationship of user	maintained independence and objectivity from area of enquiry	subjectively dominated
development continuum (by following that paradigm)	gradual transitions, discontinuities due only to imperfect knowledge	chaotic, misdirected

Table 3, The Scientific View of Interpretivism

Thus science perceives interpretive accounts of reality to be fragmentary and beyond proof. It perceives interpretive method to be random and unstable, and the object of enquiry to be contaminated by researcher or user involvement.

The following table describes those same parameters as seen through the eyes of the interpretivist:

PARAMETER	SCIENTIFIC PARADIGM	INTERPRETIVE PARADIGM
ontological commitment	distorted by the imposition of a singularity	essence of realities
method of enquiry	predetermined, inflexible	intentional perception
nature of evidence	predetermined selective (if it does not fit with pre-definitions of evidence you do not select it	derivable, non- replicable
nature of knowledge	limited, contextually barren (discovery of nuclear power considers no moral aspect	interpretively descriptive of reality
purpose of knowledge	self-justification	enhanced understanding of realities
terminology (language)	rigid, restrictive (in support of rigid processes)	flexible, adaptive (because it is impossible to predict the kind of realities we will encounter)
relationship of user	mistakenly detached	mutually inter- dependent with encountered phenomena
development continuum following that paradigm)	entrenched, vested interests, discontinuities unwelcome/resisted (Copernicus/Newton etc. -it means you have to relearn all your science)	relies on alternatives (by and inherent discontinuities (if there were none the need for this paradigm would disappear)

Table 4, The Interpretive View of Scientism

As this table shows, the interpretivist believes scientific evidence to be selective, the nature of scientific knowledge to be limited and the object of enquiry to suffer from the researcher's detachment.

3.2.2 Worldviews: Conclusions and how they Relate to the Researcher's Perceptions of Reality

Given the complex and very varied nature of the world in which we live it was considered by the researcher unlikely that either position and its ensuing approach was totally right or totally wrong. Rather it was perceived that a balanced view would probably admit both viewpoints have strengths and validities as much as they have weaknesses.

It was also considered that this was particularly the case in this research, and at this stage of the research, which focused on both human and designed systems in understanding knowledge transformation. This stage also, as mentioned above, sought to develop a view which might be refined and developed by later testing against real life experiences and observations. As Checkland (1981) observes, designed systems:

'.... once they are manifest, 'could only be as they are,' but human activity systems can be manifest only as perceptions by human actors who are free to attribute meaning to what they perceive.' (Checkland, 1981: 14)

Science was, therefore, considered necessary and vital, but it was recognised that there are many things it could not address, nor was it designed to. It was designed to be, and is, successful in relation to a particular worldview and, it is argued here, to the parts of reality that worldview reveals and holds significant. As Checkland (1981) also observes:

‘.... science also has many limitations Outside science but within the area of problems we might hope it could help us tackle, we find the method of natural science apparently impotent. Complexity, in general and social phenomena, in particular both pose difficult problems for science; neither has it been able to tackle what we perceive as ‘real world’ problems (as opposed to the scientist-defined problems of the laboratory).’ (Checkland, 1981: 13)

In addition, as observed by Porter (1995) whether or not it is the case that science can yield ‘true’ knowledge about real life phenomena:

‘.... it must nonetheless do so through social processes. There is no other way.’ (Porter, 1995: 11)

For instance, a consideration might be a belief that although all reality may not be external to the individual, ‘matter’ exists independently of our cognition of it. If and how it is labelled, whether or not it becomes part of the reality we can, or choose to, perceive in our ‘social’ reality, as opposed to what might be termed ‘extra-social’ reality, might be seen to be a product of social processes. Thus, whether the existence of the phenomena labelled ‘bones’ is known to a society does not preclude existence of such arrangements of matter. It does not preclude scientific exploration of its structure, and of what that structure can reveal about other such structures and their relationships to different structures. Labelling as ‘bones’ not only reflects an inclusion of such matter within the reality of particular worlds, it also carries understanding of how that phenomena fits into that social construct. Within this research no a priori assumptions were made with regard to how different ‘societies’ viewed and understood the same phenomena. It might have been the case that social labels were subject to differing uses by different social groupings, and to different degrees of social uncertainty within that. Schatzki (1983) claims that:

‘In fact, the factors that determine meaning are the factors that determine understanding. So the meanings of phenomena and one’s understanding of them are complementary; by being socialised one comes to understand the roles items play in our activities and correlatively, an item plays no role that is not understood by someone.’ (Schatzki, 1983: 135)

As discussed earlier, this seemed to be the case where clinical work was concerned. A number of clinical observations appeared to be grounded in uncertainty and labelling was often tentative. However, such data seemed to be viewed by statisticians as hard, objective fact, its labels as sound and precisely descriptive of their real-life phenomena.

Rorty (1979, 1982) offers further insights and additional justification for the approach described here. He argues that such spectral opposites as subjectivity and objectivity may not be sufficient in exploring and representing reality, and that 'justified' knowledge arises from the pragmatic consensus of people in a specific community. Thus epistemic authority lies in their 'unforced' agreement (Rorty, 1982: 173). Porter (1995) also offers insights with his observation that, in current philosophical usage, subjectivity speaks of those phenomena; beliefs, etc., which exist only in the mind of the individual. Objectivity is almost synonymous with realism. However, as Porter goes on to discuss, this notion of objectivity is somewhat 'absolute', and when considering the objectivity of, for instance, science or scientific approaches to reality, its most influential characteristic might be defined as its social ability to reach a consensus. Thus, as Porter observes, we have what Megill (1992) refers to as 'disciplinary objectivity'. Interestingly, Porter goes on to observe:

'.... this sort of objectivity is not self-subsistent. Its acceptability to those outside a discipline depends on certain presumptions which are rarely articulated

(Porter, 1995: 4)

The presumptions referred to are the underlying commitments which both characterise disciplines philosophically and locate them within specific paradigms. This reflects an acceptance of paradigm-located knowledge, which neither accepts nor refutes either of the above, and may add to each. It could be held in tandem with the beliefs of the scientific community or, if social influences on 'knowledge' are accepted, with the beliefs of the radical interpretivist. Drawing on the work of Sayer (1984):

‘.... the world can only be understood in terms of the available conceptual resources, but the latter do not determine the structure of the world itself. And despite our entrapment within our conceptual schemes, it is still possible to distinguish between more and less practically-adequate beliefs about the material world. Observation is neither theory-neutral nor theory-laden. Truth is neither absolute nor purely conventional and relative, but a matter of practical adequacy.’ (Sayer, 1984: 78)

This last point is important. As further noted by Sayer (1984):

‘Not just any conventions will do: they must be usable in practice.’ (Sayer, 1984: 65)

This is taken further by Johnson (1995) who observes that:

‘This prevents ‘science’ becoming a purely intersubjective representation of, and consensus about, reality The pragmatic criterion operates as people adjust and reject schemas when the practical expectations they support are violated.’ (Johnson, 1995: 8)

This scenario, as further noted by Johnson (1995):

‘ implies that we have feedback from an independent ‘reality’ which constrains and enables practice that would otherwise be inconceivable.’ (Johnson, 1995: 9)

In either event, in this context truth is a changeable artifact and knowledge reflects that which is held to be true by a given community at a given time (Barnes, 1974). This view also finds some support in the history of science, for, as also noted by Barnes (1972) although it is:

‘.... the fully accepted beliefs of our current science that are used as touchstones of truth The history of science presents something of a problem, for it is inescapably apparent that illustrious scientists of the past held views widely at variance with present ones. The situation can be saved by replacing the notion of truth with what ‘rationally follows from the available evidence.’”(Barnes, 1972: 5)

This was taken as a fundamental premise of this research. Thus, one objective was to

follow that consensual 'truth', in terms of whether and how it was transformed, rather than primarily to attempt to prove or disprove the existence of an external reality.

On this basis this research did not seek to defend or refute any position on the issue of philosophical reality. Rather, it was conducted using what might be described as a 'multiview' or transdisciplinary approach. In other words, the researcher engaged in an iteratively enriching process of understanding, bringing to bear on the research problem the philosophical assumptions of the subjectivist and objectivist philosophical extremes. This approach attacked, therefore:

'.... the 'single-mindedness' of philosophers who advance theory after theory on the dubious premise that one theory can be made to accommodate all the complexity of life (and embraces) the contradictions and idiosyncrasies of life (as) its strengths, not weaknesses that need to be reconciled and explained away.' (Rorty: 1999, A5)

This approach also found support in a review of the work on Actor Network Theory (ANT) (Callon, 1986, 1997; Law et al, 1989; Latour 1989, 1991, 1997, 1998). As noted by Callon (1997) this work does not amount to a theory:

'A main shortcoming is its being everything but a theory.' (Callon, 1997: 2)

However, it was helpful in the process of framing a philosophical approach to the research because, as noted by Latour (1997) it has attempted to bypass the question of social construction and the realist/relativist debate, which it views as never having been a pertinent question. It suggests that both scientism and relativism stem from misunderstandings about the nature and practice of science and reality, and argues away from sociological and methodological reductionism, towards a more integrated approach to explanation. Thus, ANT:

'.... collapses conventional boundaries between science, technology and society into a seamless web of stronger or weaker associations Factmaking becomes a collective business in which resistance must be overcome or realigned.' (Brown, 1992: 79)

The explanatory aspects of this work are returned to later in this thesis. However, in terms of the approach taken to the work at this stage, ANT found both the scientific and interpretive, or social, schools of thought to be inadequate. As noted by Brown (1992) each group is seen as having too restricted a view of reality. Instead, it explores the notion that ontologies are configured by the network of relations within which the individual is involved, and seeks to generate explanatory accounts by understanding them.

3.3 Summary

This research did not set itself so lofty a target as resolving the philosophical question of whether an external reality exists. Philosophy had failed thus far to prove the social world as being external to the individual, i.e. as imposing itself on the individual from without, as ontologically prior to the existence of any individual, as being as hard and real as the natural world, and made up of hard, tangible and relatively immutable structures. Nor had it proved it to be the product of individual consciousness, i.e. made up of no more than names, concepts and labels used to structure 'reality'. Radical protagonists of each stance continued to refute the value of the other. This research had the benefit of being able to explore knowledge apparently reflective of both philosophical extremes, and began with the view that each was designed to be successful in relation to a particular 'worldview', and that subjects of enquiry could benefit from application of the potential insights inherent in different perspectives. In other words, this research started with the position that a balanced view might admit both as being valid in certain circumstances, and that this approach, which was reflexively transdisciplinary (Holland, 1999) might yield more penetrating insights. Within the research the insights provided by each view, and relevant intervening views, were therefore employed as appropriate. Thus the research explored the philosophy of the scientific paradigm, but this did not indicate an innate bias towards the scientific lense. As was discussed earlier, the author did not consider herself to have a direct line to philosophical truth in terms of having resolved the subjectivist/objectivist debate.

Rather she considered a secondary aim of this research to be development of a contribution to that on-going debate, by means of the observations and insights she expected to generate, particularly as it would address reflections of both sides. Thus the contextual and theoretical focus represented an attempt to explore and explain the problem by bringing to bear upon it salient features of each approach. It sought a better understanding of types of knowledge and issues arising from that. It sought to understand how reliable the knowledge is for given purposes, rather than focusing on the more nebulous concept of context-free reliability or 'truth'. An important aspect of the work was, however, to identify and explore anything taken to be 'truth' about the world.

Chapter 4, The Research Problem Addressed through the Literature

4.1 Introduction

This chapter describes how the research problem was explored through the literature by investigating key areas of conceptual work, which build on and relate to the discussion in chapter 3. The main areas of theory explored were Artificial Intelligence, Knowledge Representation, the Sociology of Knowledge, and Philosophy (as discussed in chapter 3). A number of other important areas of conceptual work within or associated with each of these fields were also explored.

This discussion is presented in four sections. In defining the research boundary and questions, and the approaches to be taken, the concepts of 'data', 'information' and 'knowledge' were central and ran through all stages of the research. For that reason, the report of the literature review begins with discussion of these terms and what they mean to the researcher (section 4.2). The second section describes and discusses the choices of conceptual work considered and reviewed and the rationales for those choices (section 4.3). In the third section (4.4) the research problem is explored by applying these areas of conceptual work to what were perceived to be the key factors either at work, or potentially at work, in the problem situation. These were the organisational context, hardware and software systems, including digital computers, coded systematised nomenclatures, statistical classifications, the discipline of statistics, and people. The chapter closes with a final section discussing key theories which emerged from the review (section 4.5).

4.2 The Question of Data, Information and Knowledge

Exploration of these concepts began with the work of Popper (1972) who advised:

'One should never quarrel about words, and never get involved in questions of terminology What we are really interested in, our real problems are problems of theories and their truth.' (Popper, 1972: 310)

However, this advice was offered for situations where definitions, although in question, have been established. Insights were then drawn from the work of Earl (1996) Checkland and Holwell (1998) and Davenport (1997) who tried to develop distinctive descriptions of the three terms for application in the field of IS. What quickly became clear from these explorations was that this process of differentiation would not be unproblematic. As noted by Davenport (1997):

‘Take the old distinction between ‘data’, ‘information’ and ‘knowledge’. I resist making this distinction because it’s clearly imprecise. ‘Information’ is after all an umbrella term for all three, and also the connection between raw data and knowledge eventually attained.’ (Davenport, 1997: 8)

This fairly typical assertion is echoed by Checkland and Holwell (1998) who conclude:

‘.... there is at present no well-defined definition of such terms as ‘data’ and ‘information’ upon which there is general agreement.’ (Checkland and Holwell, 1998: 86)

Despite this they considered it worthwhile establishing some differentiating descriptions. Starting with ‘data’, a number of definitions were found, as detailed in Checkland and Holwell (1998):

‘Data represents unstructured facts.’ (Avison and Fitzgerald, 1995: 12)

‘(Data is) Raw facts that can be shaped and formed to create information.’ (Laudon and Laudon, 1991: 14)

‘(Data is) The raw material of organisational life; it consists of disconnected numbers, words, symbols and syllables relating to the events and processes of the business.’ (Martin and Powell, 1992: 10)

Davenport (1997) offers a similar observation:

‘I define data as ‘observations of states of the world’ - for example, there are 697 units in the warehouse’ (Davenport, 1997: 9)

Data can, therefore, be somewhat loosely defined as the raw material of information.

Turning to ‘information’ Checkland and Holwell (1998) offer the following collection

drawn from a number of authors:

‘Information is that which results when some human mental activity (observation, analysis) is successfully applied to data to reveal its meaning or significance.’ (Galland, 1992: 127)

‘(Information is) Data that has been processed so that it is meaningful to a decision maker to use in a particular decision.’ (Hicks, 1993: 675)

‘(Information is) Data that have been shaped or formed by humans into a meaningful and useful form.’ (Laudon and Laudon, 1991: 14)

‘(Data is) transformed into information when meaning is attributed to it.’ (Checkland and Holwell, 1989: 95)

Drucker (1998) follows a similar theme, defining information as:

‘ data endowed with relevance and purpose.’ (Drucker, 1998: 46)

Information can be said to exist, therefore, where people ascribe attributes of relevance, purpose and meaning to data. Meaning is a function of context. This makes it variable and is consistent with the notion that an information system is a social, not a neutral system. The implications of this social dimension are discussed by Davenport (1997) in his discussion about what information is:

‘Information is also much harder (than data) to transfer with absolute fidelity somebody is bound to disagree with your definition of it.’ (Davenport, 1997: 9)

Checkland and Holwell (1989) also discuss this, noting that, what is generally overlooked is:

‘.... the fact that different people may attribute different meanings to the same data, or indeed, different meanings at different times’ (Checkland and Holwell, 1989: 95)

The concept of ‘knowledge’ proved to be no less problematic to define. Checkland and Holwell (1998) define it as:

‘... larger, longer living structures of meaningful facts.’ (Checkland and Holwell, 1989: 90)

Davenport concurs, (1997) defining knowledge as:

‘ information with the most value precisely because someone has given the information context, meaning, a particular interpretation, somebody has reflected on the information, added their own wisdom to it (it) implies synthesis of multiple sources of information over time.’ (Davenport, 1997: 9-10)

Davenport also interestingly notes that knowledge is:

‘ unruly predefined categories can’t capture its fuzzy, frustrating diversity.’ (Davenport, 1997: 9-10)

Knowledge may be defined, therefore, as being made up of structures of related information, which may be expected to have a more prolonged existence than information, the meaning of which is seen to be more transient. Knowledge may also be taken to include, or at least be characterised by, intuition, judgement, experience, and opinion, all of which are the reservoir within which new data is processed. The notion here is that knowledge is a store, which is maintained or added to by engagement with data and from that engagement information and data are also produced. Thus the notion of ‘action’ is inherent in concepts of knowledge. O’Dell and Grayson (1998) concur and provide a useful summary drawing together all of the above:

‘Knowledge is information in action. Knowledge is what people in an organisation know about (for instance) their customers, their products and processes whether that knowledge is tacit or explicit. Data (facts and figures, context and interpretation) and information (patterns in the data) are not in themselves knowledge.’ (O’Dell and Grayson, 1998: 5)

So, for instance, the DH accumulates *data* about patient usage of the NHS. It takes that data and analyses it to determine patterns of disease. This might show that heart disease has prevalence in terms of morbidity in the population. It takes this *information* and hypothesises that, without a public health campaign the burden from heart disease on the NHS is likely to grow. Armed with this *knowledge* it takes action and launches a campaign designed to encourage healthy lifestyles among the population. If we continue to apply this to the NHS, management information is inferred from clinical data. Operational and policy decisions are made on those inferences, for instance,

about efficiency of service (can we close one of two intensive care facilities, etc.). These inferences draw, to some extent, on existing knowledge of the NHS.

This differentiation, while hardly constituting a rigorous definition, was considered helpful therefore, because a focus on meaning and the creation and recreation of meaning was central to this research and to the exploratory approach used. Data was clearly seen to be moving in the problem domain. The question was whether meaning was also traversing cultural boundaries, or whether, in fact, meaning was being created anew in each social setting.

4.3 The Implications of Philosophical Considerations for the Conceptual Areas of Work Reviewed

A view of the problem was developed by bringing together three bodies of conceptual work, which were all quite distinct from each other. They were also highly relevant to the central concerns of the research, which were people, knowledge and systems and the paradigms and cultures within which they operated. As described above, the three main bodies of conceptual work were Artificial Intelligence (AI) Knowledge Representation and the Sociology of Knowledge, including scientific knowledge, particularly as it applies to numbers. This combination reflected the fact that both scientific and social theories of knowledge were recognised as having strengths in relation to the research. As each major theoretical field was studied it often led to a widening of the review to include associated literature, so that classes of literature with a common philosophical perspective emerged. While the main theoretical drivers of the work remained at the higher levels described, these associated literatures provided essential additional insights, so that a more rounded understanding was achieved.

The first two areas of work, AI and Knowledge Representation were reviewed by exploration of the work of a number of key authors, including Fetzer (1996) Krause and Clarke (1993), Shanker (1987) and Dreyfus (1972, 1985, 1986). Both of these areas are exemplars of the scientific paradigm. Knowledge Representation is a branch of AI, and encompasses representation of real life phenomena through data, and specifically

through taxonomic classification. This was at the heart of the explicit transformation processes affecting the knowledge explored in this thesis. AI is the science of designing computer systems that perform tasks that would normally require human intelligence. As discussed by Bloomfield (1987) and Barnes (1974, 1977) the influence of the paradigm that legitimises this world-view is significant. Drawing on the work of Fleck (1987) in considering AI a 'world-view' shared among a specific thought collective, Bloomfield (1987) asserts that AI, like other products of science, is part of the scientific culture of its conveyors. All digital computers, which are another key focus of this thesis, fall within this paradigm. This was considered to be of particular relevance because a number of the systems being studied in the problem domain were involved with the transformation of clinical knowledge, and the underlying principles of AI could be argued to underpin all 'scientific' approaches to reality. These were taken as including computer systems and systems of codification and classification such as those used on clinical information within the NHS. Thus, current thinking on the practical implications of this position could be reviewed, particularly as the work of both protagonists and antagonists in this field was considered.

Inclusion of AI in the review was also considered appropriate because it represents the most extreme of the application of objectivist assumptions, as applied to computer science (Dreyfus, 1972, 1985, 1986). In other words, AI was considered to be the fullest expression of the philosophical commitments that characterise computerised information systems generally. The literature review placed a particular focus on the application of this discipline to human decision-making, which is another key feature of this thesis, and the machine-based models of 'intelligence' which codifying and classifying of knowledge are designed to enable. This had a number of important aspects for the research. Firstly, it was hoped that its position at the extreme would make its assumptions clearly discernible. Secondly, the main problem that has consistently resisted the efforts of AI researchers is that of representing and replicating everyday context. This irrefutably demonstrates that context is an inherent part of knowledge. Also, it seems there are aspects of the real world which are not amenable to structured, formalised description. A question for the research, in studying the lessons of AI, was which category clinical phenomena fitted into.

Exploration of the protagonists' views in these areas was explored through the work of a number of influential authors. These included Sowa (1994) who focused particularly on the logical, philosophical and computational foundations of knowledge representation in artificial intelligence systems. As noted by Sowa, systems built around the concept of knowledge representation:

'... take advantage of the hidden treasures in the knowledge but they depend on people who can reflect on the knowledge, become better conscious of it, and translate it to a computable form.' (Sowa: 4, 1994)

Thus, while Sowa recognises people have a role, it is clear that knowledge, in the scheme of this discipline, is deemed to be ultimately computable.

Exploration of this view was continued by drawing insights from the work of Musen (1989) who focuses on model-based knowledge acquisition tools and Fiegenbaum and McCorduck (1985) who claimed revolutionary developments in AI that would shortly make it a reality.

A counterbalance to this worldview was explored through the work of a number of authors, particularly Dreyfus (1972, 1985, 1986) and Weizenbaum (1985). They present challenges to AI at the most fundamental levels in their arguments against its philosophical assumptions, and the reasoning and systems that flow from them.

That this research focuses on NHS computer systems could arguably raise a challenge to the inclusion of AI in this review. AI is the parent of expert systems, and systems in the problem domain of the NHS are known to be much less sophisticated. However, inherent in the research problem at issue here was the possibility that, while NHS systems may in some ways be unsophisticated, some of the phenomena with which they deal, e.g. clinical knowledge and information, are not. A review of a field that overtly seeks to address the complex real life phenomena of knowledge was, therefore, considered to be potentially useful.

Also reviewed within this broad area was the literature on Computer Science (French,

1996, Goldschlager and Lister 1988, Shave and Bhaskar, 1982) and within that Modelling Theory (Vemuri, 1978, Smith, 1985). These followed naturally from exploration of AI and Knowledge Representation, and they were useful in providing further insights into the effects on NHS computer systems of underpinning philosophical assumptions.

A further area of conceptual work in this class was Information Theory. Here the review drew most heavily on the seminal work of Shannon et al (1962). This describes how this mathematical theory of information was originally developed to solve problems in communications engineering. It asserts, as described by Dreyfus (1972) that it is the job of programmes to represent a transition from statements which are meaningful (contain information in the ordinary sense) to the strings of meaningless discrete bits (information in the theoretical, technical sense) with which a computer operates. This theory carefully excludes as irrelevant to the engineering problem the *meaning* of what is being transmitted. What it is important to recognise is that, as noted by Weaver (in Shannon et al: 1962) in this theory the word 'information' is used in a special sense that is not to be confused with its everyday usage. In particular it must not be confused with meaning. For instance, within this work, two messages, one of which is loaded with meaning, the other of which is pure nonsense, can be exactly equivalent in this informational sense. This theory seeks to enable reproduction at one point, either exactly or approximately, of a message selected at another point. Meaning, therefore, has no relevance in this schema.

Notably, so powerful were the concepts of this theory that attempts have continually been made to modify them for use in other contexts. Hence the argument put forward by Dreyfus (1972) that as a theory of meaning this is not plausible, particularly if one considers the view of Gestalt psychologists, who claim that perception is always a global process. This does not, however, alter this basic premise on which computer programming operates. Dreyfus (1972) again provides a useful insight when this is related to the research problem:

‘.... when *illegitimately* (author’s italics) transformed into a theory of meaning, one sees being built in the computer-influenced assumption that experience is analysable into isolable, atomic, alternative choices.’ (Dreyfus, 1972: 77)

This confirms the notion that success in basic, number crunching digital computers has resulted in extension of their basic principles and application into more problematic areas. For this research these were taken to include highly context-dependent, subjective clinical phenomena.

Shannon’s work was further contextualised by reference particularly to that of Ackoff (1953) Ackoff and Emery (1972) and Davenport (1997) who also argue for a less ‘rational’ approach to information behaviour:

‘Most research on how individuals process information suggests that we’re far from fully rational in our acquisition and use of it.’ (Davenport, 1997: 100)

The third class of literature reviewed was firmly rooted in the subjectivist paradigm. It consisted of the Sociology of Knowledge, and, more specifically, the Sociology of Scientific Knowledge. The first two classes of conceptual work were ultimately, and somewhat paradoxically perhaps, deemed to nest logically within this third area. The paradox is, however, somewhat lessened by earlier observations regarding science employing socially-defined measures

The need to explore the influence of people on the research problem has to some extent been discussed above. Exploration of the Sociology of Knowledge was considered essential in this regard, this area of conceptual work being concerned with analysis of the social construction of reality and of meaning. It also focuses on the large-scale relationships between knowledge, social interests and social structure, and the problems generated thereby. It is concerned with the concept that phenomena present themselves in various ways according to different social settings. This was considered particularly relevant for two main reasons. Firstly, it would enable necessary insights into the subjectivist approach to reality. Secondly, it is concerned with challenging the notion of ‘objectivity’ that underpins scientific work, within which medicine was included. As discussed earlier, there existed a significant difference between the original clinical

knowledge and the meaning of the clinical information that the clinician recorded, and the nature and meaning of subsequent aggregate information allegedly based upon that. Also noted was the fact that healthcare data was the product, and in some senses the nexus, of significant and different cultural traditions and professional interests. The information in question journeyed through, and was transformed by, several groups or handling centres. Each had substantial differences, which at a minimum encompassed profession or occupation, organisational position and relationship to the organisation, and information systems. The research undertook, therefore, to explore the relationship, if any, between the changes in the information and the social processes and contexts through which it passed, taking as a starting point Barnes' (1977) observation that:

'Often (invalid) descriptions are the products of social interests which make it advantageous to misrepresent reality, or social restrictions upon investigation of reality, which make accurate perception of it impossible.' (Barnes, 1977: 1)

This area of work potentially, therefore, offered explanatory theory relating to the paradox perceived in clinical work and data and associated statistical data sets.

This part of the review began with exploration of the work of Kuhn (1970). This was valuable because it provided insights into the internal processes of science. It also revealed the extent to which sociological analysis can be driven by misconceptions about scientific activity. The review then drew heavily on the work of Rosenberg (1966) who explores the relationship between scientific ideas and social structure. It also drew on Barnes (1972, 1974, 1977) Bloor (1984) and Brown (1992) who indicate the possibility that scientific 'objectivity', rather than being based on a direct line to 'the truth', is socially constructed. Barnes (1974) argues for the need to:

'.... reveal the possibilities of different kinds of sociological theory, to reflect different preconceptions of the general relationship between science and the wider society, and to balance 'social structural' with 'cultural' analysis.' (Barnes, 1974: 15)

Further areas of work reviewed in this context were that of Rorty (1979, 1982, 1999) who provides insights into the concepts of 'truth' and objectivity, Collins et al (1993)

and Foucault (1972, 1973, 1980) who analyses rationality and the human sciences and their relationship to 'truth'.

More specific works of interest in exploring clinical knowledge included that of Dolby (1971) who focuses on the role of sociological factors in the knowledge-producing activity of science. Findings in this area were enhanced by review of the work of Needham (1956) who explores the effects of cultural differences on 'science', and Geertz (1973). Also reviewed was work by Durkheim (1973) who focuses on the effects of social interaction explored through the lens of science. Durkheim's work (1963) on 'primitive classification' was also drawn upon.

Further useful work in this area was that by Hall (1992, 1993) who explores the way meanings are created by symbols and human interpretation, and the relationship of that process to culture, Habermas (1968) who explores the relationship between knowledge and human interests, and Goffman (1959, 1967, 1972) who analyses the apparent orderliness, stability and predictability of social interactions. This was achieved by closely exploring what individuals do and why, when they are in each other's company, and also how this is understood by participants. Weber, (1978) was also drawn upon, particularly in terms of his framework for analysis of authority or 'legitimate domination' (in the case of this research, by both clinical and non-clinical groups).

Other relevant work reviewed in this class included that of Bernstein (1971) who explores the sociology of language, and in particular social closure and maintenance of professional position through language. This notion was perceived as potentially helpful in exploring the effects of cultural differences between the groups being studied. These insights were further enhanced by exploration of Johnson's work (1972) on professions and power.

As described in chapter 1, clinicians work within a culturally diverse environment. Insights were, therefore, further enhanced by review of work in the field of the Sociology of Scientific Knowledge, particularly as it applied to the use of numbers and quantification (Porter, 1995, Kilpatrick, 1973, Tiles, 1989). Included in this part of the

review was the apparently scientific field of statistics. The researcher came to this work with a thorough and relatively uncritical grounding in the theory and practice of statistics. Having already noted an apparent discrepancy in the relationship between clinical data in the clinical environment and national statistical data sets, the review sought texts that critiqued the notion of statistics as a 'scientific' endeavour. The work of Porter (1995) and Latour (1989) both of whom explore at length the inherently social nature of the art of statistics, was particularly influential.

The development of many disparate strands of social thought was usefully pulled together for the researcher towards an explanatory theory of social action by Parsons (1949). This process of exploring further explanatory theory was then progressed most particularly by exploration of the work of Giddens, (1976, 1984) whose work:

'.... always gravitated towards the intersecting strengths of theoretical positions.'
(Cohen, 1998: 279)

It encompasses, therefore, exploration of the key theories and theorists in the field of sociology, including Marx, Weber and Durkheim. As Cohen goes on to note:

'.... he pulls ideas out of distant orbits back to intellectual common ground.'
(Cohen, 1998: 279)

In so doing Giddens provides theoretical insight, in particular with Structuration Theory (Giddens, 1976, 1984), which takes account of a more complex sociological situation than his predecessors.

The review also drew heavily on the areas of Medical Sociology and Medical Informatics. While it is arguably an emerging discipline, Medical Informatics literature was central to the review in that it works in the overlap between IS and clinical practice. It provides, therefore, specific insights into the process of clinical knowledge generation and application. It is also a field that recognises that generic medical and information science alone do not provide the necessary basis for successful information handling in clinical practice. Because the two sciences are embedded in a complex ecological environment, other aspects are considered so that, as discussed by Sellos

(1992) a new paradigm is emerging with this discipline:

‘It appears that only a particular mix of methods, such as information science, medicine, technology, science, economics, statistics, sociology and legal science, is adequate for a comprehensive interdisciplinary statement, which characterises the specially applied science of medical informatics.’ (Sellos, 1992: 80)

Medical Informatics was addressed particularly through the work of Kluge, (1996) and De Dombal (1996) both of whom explore the process of the acquisition of medical knowledge, not only theoretically, but also through case study work, which was deemed to be an invaluable added dimension. Kay et al (1996) were also drawn upon, not least because they also adopt this approach in investigating the generation and application of clinical knowledge.

In the area of Medical Sociology, the work of Scambler (1999) was particularly useful. In applying sociological theory to the area of medicine he explores those aspects of the two-way relationship between the individual and wider society that influence the experiences of health and illness in individuals and the response to them of others, including doctors. Also influential in the area of sociology as applied to medicine was Wittgenstein’s view of the human sciences, as discussed by Schatzki (1983) in terms of contemporary conceptions of the philosopher’s task. Schatzki, who argues the need for interpretive accounts of the social world, notes:

‘People acquire understanding by being trained into a form of life.’ (Schatzki, 1983: 135)

This not only indicates that predominantly social factors determine understanding, but also that robust occupational training (and medical training could arguably be described as such) can have a significant influence. This approach found further support in the work of Bruner et al (1947) Postman et al (1948) in the field of Cognitive Psychology. They address value and need as organising factors in perception. This work was useful for its perspective that ‘believing is not seeing’. They note:

‘The perceiver’s world of reality, no matter how difficult to evaluate, must be the atrating point for assessing the reliability of information.’ (Bruner et al, 1947: 69)

It is within the realm of clinical practice that the knowledge in question is initially fashioned.

The emerging discipline of Knowledge Management (KM) was also reviewed in this class. This is a concept that has achieved increasing prominence throughout the 1990s. Initial exploration of definitions of this concept indicated that it might yield useful insights:

‘KM is the process of capturing a company’s collective expertise wherever it resides and distributing it to wherever it can help produce the biggest payoffs.’ (Blake, 1998 : 2)

‘To a growing number of companies, KM is more than just a buzz-word or a sales pitch, it is an approach to adding or creating value by more actively leveraging the know-how, experience and judgement residing within and, in many cases, outside an organisation.’ (Ruggles, 1998: 82)

However, as noted, by O’Dell and Grayson (1998) KM is not yet a science or a ‘discipline’. While it is informed by a number of theoretical areas, most notably management and organisational theory (e.g. Daft and Weick, 1984, Leavitt and March, 1988) the review confirmed it as a management concept rather than a theoretical area in its own right. It remained, therefore, debatable whether KM as it was then understood through the available literature was an area that offered theoretical insight to what were perceived to be complex social issues. For that reason it was not used as an engine to drive understanding in the research, although KM literature did raise some important themes. These included an awareness that KM adopts the important conceptual approach of addressing the issues raised by attempts to manage knowledge. However, it does this by a largely technological approach, which overlooks the importance of people and context. The extent to which the research might show this to be a disabling feature of KM was of interest.

A second important theme that was raised by review of this area came from the work of Davenport and Prusak (1998) who assert that the relative difficulty of capturing and transferring knowledge depends on the kind of knowledge involved. While the reference is to a relatively simplistic notion of explicit and tacit knowledge types,

which overlooks any notion of the relevance of certainty of knowledge, it was clear that different types may require different handling. A focus on knowledge types was deemed useful to pursue throughout the research, and the potential for a subsequent contribution in this area was also maintained.

A third class of work developed from the areas discussed above. This continued with a central theme of the research by balancing a social with a mathematical view of information, and a behavioural with a mechanistic approach to problem solving. As a class it was relatively young but hugely influential, as it contained the area of IS work (as opposed to pure Information Theory) and also that of Information Management. This part of the review drew on a wide range of literature. Most notably this included the seminal work of von Bertalanffy (1968) whose work on General Systems Theory (GST) led to his recognition as the founder of the systems movement, and Lilienfeld (1978) who critiqued the emerging GST. The review in this area also drew heavily on the work of Checkland (1981) Checkland & Holwell (1998) and Davenport (1997) who have written extensively about the notion that computers are not simply technology, and information is not simply data, but that the two combine to form a system that is as human as it is technological:

‘Understanding how *individuals* handle information is at the core of all information behaviour analysis.’ (Davenport, 1997: 99)

This relatively new approach was considered by the researcher to be an essential bridge between the hard scientism that had prevailed in systems work for so long, and the more ambiguous notion of ‘problems’. It was also seen as an important link between the notion of systems as technology in a mechanistic world, and the idea of systems as ‘human activity systems’ (Checkland, 1981: 14, Checkland and Holwell, 1998: 13). In other words, it was included because it recognises people and social context as inherent and influential parts of systems and systems problems.

Exploration was also undertaken of the work of a number of writers, broadly or specifically supportive of the ‘human’ approach, but who chose to focus on particular issues this raises. These included Wilcocks and Mason (1987) who explored the issues

involved in the apparently unproblematic process of computerising work, Robey et al (1984) and Markus (1983) who consider the notion of rituals at work in systems design. They also included Markus & Bjorn-Anderson (1987) who consider the notion of the power of the systems professional, Kling (1987) who considers the relationship between the notion of social transformation and computerisation, and Land (1986) who argues for recognition, in the field of information management, of the distance between social perceptions of rationality and actual human behaviour.

Within this class, the work of Walsham (1993, 1995) was particularly useful in both the field of IS and that of Organisational Theory (OT), particularly as it relates to information management, due to its underlying philosophy that is:

‘.... aimed at producing an understanding of the *context* of the information system, and the *process* whereby the information system influences and is influenced by its context A more subtle set of contexts for an information system are the various social structures which are present in the minds of the human participants involved with the system, including designers, users and any of those affected by the system Their interpretation of reality, their shared and contested sense of the world, create complex, interacting contexts within which the information system is drawn on and used to create or reinforce meaning.’ (Walsham, 1993: 4-5)

4.4 Findings from the Literature Review

Many possible ways of presenting this section were considered, including by conceptual area and by stakeholder group. The one chosen is organised around the key factors known to be, or considered as potentially being, at work in the problem situation. This particular approach was stimulated by the work of Alexis et al (1967) who observe that, typically, in organisations information is relayed through several processing centres. At each such centre there is a tendency to revise it, consciously or unconsciously, before transmitting it to the next unit in the network. They note:

‘Decision units select and transform information input.’ (Alexis et al, 1967: 15)

They note also that individuals often:

‘.... ‘see’ things in terms of their own needs and goals the perception of the original observer is selective in the sense that the information he transmits to the receiver depends (at least) on his evaluation of its relevance for decision-making purposes.’ (Alexis et al, 1967: 315)

Nonaka (1998) concurs:

‘People don’t just receive new knowledge, they actively interpret it to fit their own situation and perspective. Thus what makes sense in one context can change or even lose its meaning when communicated to people in a different context.’ (Nonaka, 1998: 39)

Thus the information is ‘filtered’ or transformed at each relay point. Alexis et al (1967) also found that:

‘It frequently is not possible to assign any degree of reliability without having some knowledge of the kind of revision that took place in the information flow.’ (Alexis et al, 1967: 315)

The problem domain, therefore, was considered in these terms and the literature was reviewed in order to ascertain the status of the current spectrum of thinking about the nature of technical and manual systems. The effects of their inherent natures on information were also studied. The nature of people, as part of both systems and organisational contexts, and any implications there, were also considered.

Presentation of the review of the relevant areas of conceptual work has been organised, therefore, firstly around analysis of the organisational context. It is then structured around descriptions of key characteristics of hardware and software systems. These include digital computers, systematised nomenclatures, statistical classification systems, statistics, and people. This is followed by discussion of their implications for the research problem.

4.4.1 The Organisational Context: Structure and the Research Problem

This part of the discussion builds on the earlier first level analysis of the organisation provided in chapter 2.

One of the more visible manifestations of information use and flow is what is known as 'organisational structure'. Structure in this sense has been variously perceived and described, most notably within OT (Silverman, 1970; Dalton et al, 1970; Minzberg, 1983; Handy, 1985; Reed, 1992) and encompasses both the formal information flows, for example, official reports, and the informal or unofficial channels and flows. 'Structure' is, however, a conceptual phenomenon, most useful to analysis of the social context known as organisations. Structure is concerned with relationships and action. Information, its nature, use and flow could arguably be described as both the enabler and the manifestation of these relationships. For the purposes of this research structure was, therefore, taken to be the intrinsic and operational characteristics of the web of relationships and actions that make up an organisation and define its social location. It was also taken to be their sanctioning and censoring norms, which translate into how an organisation undertakes its business and negotiates on both an internal and external level.

Looking first at key groups and how they were related to each other, it could be argued, given the highly bureaucratised nature of nationalised industries, that the Government would have sought a tightly controlled, unitary machine bureaucracy. The implicit assumption here is that the realm of medicine is amenable to such control, i.e. predictable, objective, rational, quantifiable, etc. Due, however, to the power of the professionals, what it achieved was an organisational type which addressed first the desires of clinicians for a level of autonomy and clinical freedom, constrained only by the governing professional body, and which fitted patient care around that. This type better fits what Mintzberg (1983: 191) describes as a 'Professional Bureaucracy' than the Government's preferred model. This has profound implications for organisational information.

Operationally, a professional bureaucracy is one that is bureaucratic in terms of the approach to the core work. In the NHS, the core work of caring for patients is characterised, at least at a macro level, by a reductionist, scientific approach. This divides the body into anatomical sites, within which the clinicians' standardised range of skills might more easily be applied. However, standards for this work are generated,

not by the organisation, but by self-governing institutions residing outside the organisation and holding primacy in terms of professionals' loyalty. In the case of clinicians the external standard-setting body is the British Medical Association (BMA). Hence there exists the situation where professional skills become standardised but, because of the sanctioned operation of human judgment, their application and the knowledge this yields are variable.

Professionals are rarely, however, the only members of an organisation. There is usually a support staff surrounding them, facilitating their work and performing as many of the 'routine' tasks as possible. For these groups the traditional notion of bureaucracy operates. Clinicians are well described as 'dionysians' within this environment (Handy, 1985: 195). The structure that exists does so only to support them. They perceive resources as existing solely to enable them to exercise their professional skills. This arrangement gives rise to an organisational form wherein parallel hierarchies operate. The support staff hierarchy is top-down, with a commitment to a machine bureaucracy. Here power comes from position. The professional hierarchy is bottom-up and democratic. Here power comes from expertise. In the NHS most administrative managers can be placed in the former category, clinicians in the latter. Power in this type of bureaucracy is, therefore, decentralised rather than centralised.

Kouzes and Mico (1985) offer further insights into this issue. For analytical purposes, they identify three 'domains' existing in such organisations: Policy, Management and Service (or Operating Core). Each domain has its own norms and loyalties, etc., and each is, therefore, in 'organised anarchy' (Kouzes and Mico, 1985: 454) or irresolvable conflict with the others. Applying this to the NHS, the Policy Domain is populated by the DH, which is part of the Government. Both are responsible to the public, upon whose consent their legitimacy rests. The public is both financier and customer. Public health initiatives and NHS policy are said to be reflective of its wishes. The Management and Service Domains are populated by the traditional administration of the NHS. It is responsible to both the Policy Domain, in terms of carrying out policies and strategies developed there, and to the public, for the same reasons as the Policy

Domain. The job of the administration is to manage the organisation by means of hierarchical control and linear work modes. Clinical professionals operate within the Service, and sometimes Management sectors. The overriding loyalty here is to the professional body.

Superficially, therefore, functional differentiation exists. However, the implications operate at deeper levels. As noted by Kouzes and Mico (1985) this insight is not a new one. Dalton et al (1967) note that, while the most superficial effects of differentiation (functional fragmentation of the organisation) are easily identifiable and often considered, in fact it has far more profound effects. They argue that, fundamentally, differentiation concerns:

‘.... the differences in cognitive and emotional orientations among managers in different functional departments and the differences in formal structure among those departments.’ (Dalton et al, 1967: 5)

Mannheim (1970) also makes relevant observations:

‘.... different occupational groups are thrown together and are forced to maintain themselves and their ideas in the face of the onslaught of these heterogeneous groups.’ (Mannheim, 1970: 121)

The analysis thus far indicated that issues of power and loyalty would seem to be among causal factors. Exploration of Mitroff's work (1983) indicated that fundamental perceptive processes were also involved. Mitroff asserts that a key influence determining the nature of information systems adopted by organisations is the cognitive framework and style of those involved with the systems. This informs and dictates the way individuals perceive reality and process information. This theme is developed in Mitroff's work based on a framework developed by Carl Jung. He identifies four broad types of personality; thinking, intuiting, feeling and sensing, which he maps onto the four most commonly seen types of organisation:

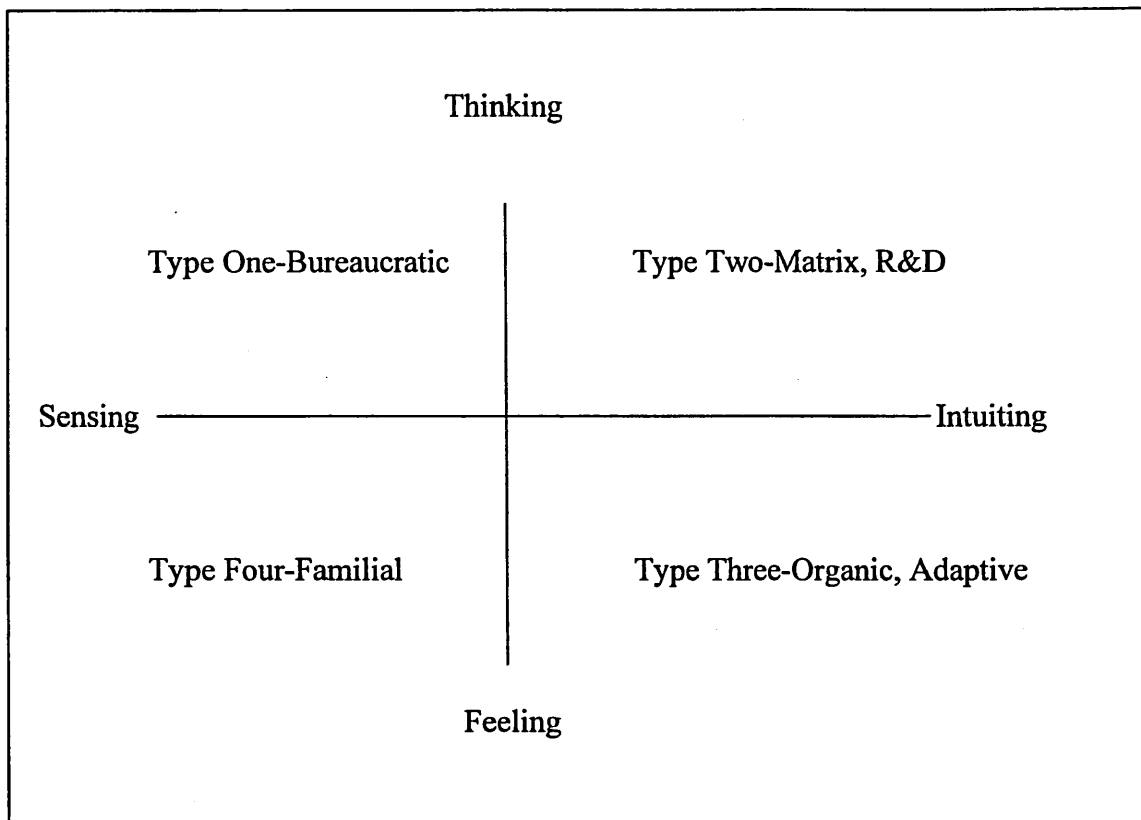


Figure 3 Mitroff's Cognitive Style Matrix (Mitroff, 1983:58)

The vertical axis indicates the two extremes of a continuum representing one dimension of the ways in which individuals reach their decisions. The horizontal axis represents the ways in which individuals assimilate data, which according to Jung is either by sensation or intuition. The former are 'analytic reductionist'. In other words, they break situations down into small detailed pieces and work on the basis of hard fact gathered about those pieces. They tend to require information systems that can provide detailed and comprehensive documentation. The latter are heuristic and focus on the overview, avoiding the constraints of detail as much as possible. They tend to prefer systems offering partial information and allowing them to exercise their intuition. Perceiving too much detail is seen as a constraint rather than a necessity. Both types take in different types of data from their perceived realities and also recognise different things as data.

Turning to the vertical axis, thinking types are perceived to base their decisions on logic and analytic reasoning. They depersonalise situations, relying on rules to control

conduct. Feeling types more overtly base their decisions on how they feel about situations and people. They seek to personalise everything by stressing its individual uniqueness.

Clearly no one individual is going to fall neatly into one cell for all informational needs, and thus it was with clinicians, who presented an interesting paradox within this framework. In terms of practice they appeared to draw on the heavily documented, acknowledged basis for all medical practice. Thus, although they displayed a 'dionysian' disregard for bureaucratic structure and control, facilitated by expert professional status, their medical methods of practice seemed to be deeply embedded in it. However, to bureaucratised information they added the judgment of the professional, to hard fact they added intuition.

Kay and Purves' (1996) description of the clinician/patient encounter confirms this. They assert that significant parts of clinical behaviour are organic and adaptive and seem, therefore, to fall into the lower left quadrant. Managers would appear to fit into the diametrically opposing upper right quadrant.

This structural arrangement manifests itself, therefore, in information, with different types of knowledge-creating preferences operating. This dimension of organisation and information is also commented on by Nonaka (1998):

'Deeply ingrained in the traditions of Western Management, from Frederick Taylor to Herbert Simon, is a view of the organisation as a machine for 'information processing'. According to this view, the only useful information is hard (read: quantifiable) data, codified procedures, universal principles. And the key metrics for measuring the value of new knowledge are similarly hard and quantifiable - increased efficiency, lower costs, improved return on investment.' (Nonaka, 1998: 23)

Thus it came as no surprise that the key management information tools in use in the NHS were coding systems designed to provide definitive data for use in management decisions. It also came as no surprise that these were seen as irrelevant to clinicians. Hence Mannheim's (1970) assertion that information between these two groups amounted to 'talking past one another' (Mannheim, 1970: 121). He also asserts that,

while different occupational groups speak as if their differences relate only to each isolated question at issue, they overlook the fact that:

‘.... their antagonist differs from them in his whole outlook For each participant the ‘object’ has a more or less different meaning because it grows out of the whole of their respective frames of reference Hence talking past one another is an inevitable phenomenon.’ (Mannheim, 1970: 121)

4.4.1.a The Organisational Context: An Initial Summary

Thus the organisational context within which the clinical data emerged was found to be one in which structural discontinuities existed at the most fundamental levels. It was considered likely that such a situation would always be problematic to an organization, purely in management terms. However, in an organisation such as the NHS, where data from one group was routinely used by another for key decisions, it was also likely that it would have significant effects on that data and, therefore, on the decisions which flowed from it. In order to explore these issues further, a focus was then placed on the systems that carried that data.

4.4.2 Hardware and Software Systems

Computers played a key role in transporting the clinical knowledge and data in question. In exploring any effects they may have had, digital computers were analysed in terms of their basic philosophical underpinnings, and then their component parts. These were taken to include the problem model they implicitly host, the solution model they explicitly host, and the components of developing that solution. They were also taken to include programmers, systems methodologies, programming languages, and the nature of the data such systems can handle. These aspects of systems were deemed to be of key importance to the research in that they reflect assumptions about the nature of reality and knowledge thereof. Exploration of them could, therefore, provide insights into the relationship of such systems to the data they processed and their effects on it.

4.4.2.a Digital Computers; A Description

Digital computers are, essentially, number processors. In terms of their components, apart from their memory, the most basic part of any computer is its processor. This contains a clock, an instruction control unit, an arithmetic and logic unit and a set of registers. The registers record the operations and operands that are being operated under the control of the programme. This, in effect, produces for the digital computer a model of the world, represented as a structured set of facts or propositions that are either true or false.

Underpinning these facilities, there are at least three kinds of models of different aspects of reality that may be involved in the design, development and utilisation of computer products (Fetzer, 1996). Because of the nature of technology, all ultimately translate that reality into a set of explicit, unambiguous, structured data. Firstly, there is the specification, which is a model of the problem to be solved. Secondly, there is the programme. This is a model of the solution to the problem, or rather to the model of the problem. Thirdly, the programme itself is often written in a programming language, which itself functions as a model for a virtual or physical machine.

Looking first at their most influential underpinnings, philosophically digital computers reflect the commitments of the scientific paradigm. As discussed earlier, this paradigm asserts that the world can be exhaustively analysed in terms of determinate data or atomic facts. This is the foundation for work on AI: that *all* that is relevant to intelligent behaviour can be formalised in a structured description (Sowa, 1994, Fiegenbaum and McCorduck, 1983). This reflects a mechanistic belief that the world can be so represented because it is external to the individual, logically ordered, with identifiable and regular relationships existing between entities. In addition, this atomistic perception, which reduces the world from the sum to the parts, is perceived as valid. In other words, emergent properties (Checkland, 1981, von Bertalanffy, 1968) or properties that emerge at certain levels of complexity and cannot be reduced in explanation to lower levels (because they do not exist there) are not perceived to exist. Computer representation, therefore, requires only adequate identification and

understanding of the various entities and relationships between them. That being the case, one might expect data about such a world to be, as described by Dreyfus et al (1986):

‘ ... discrete, explicit, determinate...’(Dreyfus et al, 1986: 188)

This is precisely the kind of data required by digital computers:

‘ otherwise it will not be the sort of information which can be given to a computer so as to be processed by a rule.’ (Dreyfus et al, 1986: 118)

This is echoed by Weizenbaum (1985) in reviewing the work of von Neumann (1958) who asserts that, if he were to be presented with a *precise* description of what the computer was required to do, someone could program the computer to behave in the required manner.

This specification fits well with the original design purpose of digital computers, which was scientific. Experience has shown, not surprisingly therefore, that they are very good at that job. Their capacity in that respect far outstrips that of the human mind to process numbers efficiently. And in that sense the work of computers is neutral. They mechanically perform a technical task. There seems, therefore, to be no significant issue in their mechanical processing of, for instance, clinical data codes. The early success of computers in this field led in part to their application to other tasks. From pure calculation they began to be applied to manipulating data in terms of numbers that represented real life entities. More recently this application has extended to areas of human expertise, like decision support by scenario modelling. Human expertise, therefore, was now perceived to fall within the realm of digital computer models.

4.4.2.b Digital Computers, A Discussion

Beginning with the purposes to which digital computers are applied, as mentioned above, the success of scientific method in certain problem domains indicated no

significant issue in the mechanical processing by digital computers of numbers per se. Nor was there perceived to be any issue where the things those numbers represent are occurrences of 'hard' phenomena, e.g. Davenport's (1997) 697 units in a warehouse discussed earlier, or numbers of total hip replacements in the NHS in one year. In other words, phenomena about which there is wide social consensus and which are not susceptible to context-dependent change within that broad society were considered to be less problematic here. However, the numbers in this study were taken to represent at least some phenomena that were particularly context-laden and open, therefore, to interpretation and variance. Thus, it was not the same as there being no issue in computer processing of 'pure' data, because information was taken to be to be data plus meaning (Checkland and Holwell, 1998, Davenport, 1997, Galland, 1992, Laudon and Laudon, 1991, Drucker, 1998). The issue seemed to be, therefore, not with the computer's ability to process numbers, but rather with the ability of those numbers to adequately represent the meaning of the underlying data. It was considered possible, therefore, that where meaning was well understood, accepted and stable, computer representation could be consistent with it. However, where meaning was less secure, possibly because it was more context-dependent, at least two effects were possible. Firstly, tentative meaning could have been becoming fixed and, given discussions above about computer models, not necessarily in the terms of the original perceiver. Secondly, because of the stability, objectivity, and scientific nature that attaches to objective data in a computer, those same characteristics could have been being globally attached to all clinical data within NHS computers, possibly even where some of it was of the less 'secure' type discussed above. A type of reification might, therefore, have been taking place, and this undoubtedly was the kind of 'transformation' on which this research was focused. It was necessary, therefore, to examine the nature of the knowledge underpinning computer data.

Further insight into this was found once again in Dreyfus' work (1972, 1985, 1986) on AI and particularly on the kinds of data required by digital computers, which as mentioned earlier:

‘.... must be discrete, explicit, determinate, otherwise it will not be the sort of information which can be given to a computer so as to be processed by a rule’
(Dreyfus et al, 1986:118)

This is supported in work he goes on to discuss by Newell and Simon (1961) who were leaders in the field of AI. They observe that, while they believe that programmed computers could, in principle, solve problems, recognise patterns, understand stories and indeed do anything that an intelligent person could do, this was on the proviso that the symbols in the computer were used to represent context-independent, objective features of the real world. It was also on the proviso that the relationships between those objective features of the real world obeyed strict rules, so that they could be validly represented in computer programmes. This is, as discussed previously, a basic tenet of scientific philosophy and, as also previously discussed, it is basically unproven that it is possible, comprehensively to do this. As argued by Weizenbaum (1987) in discussing the myths of AI, there is more proof, given the persistent failures of AI to produce a truly intelligent machine, that it is not possible. However, that specific issue apart, for clinical data processing systems, this would mean that features could not be dependent upon interpretation, like, for instance, a temperature being too high. For such systems temperature would always have to be specified in degrees. This raised a question over application of computers in the context of clinical observations, particularly where such specificity was not possible, e.g. ‘severe pain’. Returning to the remarks of Dreyfus et al (1986) about the required characteristics of computerised data, he further asserts:

‘.... there are several reasons to suppose that no such data exist.’ (Dreyfus et al, 1986:118)

As Weizenbaum (1987) also notes:

‘If words like ‘judgement’, ‘reasoning’ and ‘understanding’ are to be comprehended in their usual meanings, then the prospects for success are very dim.’ (Weizenbaum, 1987: 86)

Dreyfus and Weizenbaum both explicitly focus the discussions referred to at ‘intelligent’ machines. However, it was considered arguable that their relevance was

more extensive. 'Intelligent' machines, in that they seek to replicate human thought processes, must be knowledge-based. *All* digital computers are, to greater or lesser extents, 'knowledge-based.' If no such data exist, the validity of the data that populates our digital computers must also be questioned.

In attempting to understand how this situation of ontologically mixed data could arise, review of work in the fields of Computer Science and IS was useful. This indicated that programmers do not necessarily understand the nature of knowledge itself. That is a philosophical subject, taken to be the concern of a different expert domain, that of philosophy. Information Theory offered additional insights to this.

Looking in detail at the models underpinning digital computer software, and starting with the specification and programme models, a number of potentially relevant issues emerged. Firstly, such models depend upon the use of abstraction and idealisation, at least in the sense that they represent some, but not all, of the properties of what is modelled (Jayaratna, 1994, Wood Harper and Fitzgerald, 1982). They are inevitably partial reflections of reality. Secondly, the problem model and, consequently, the solution model are the product of a human agent, i.e. a modeller. They can simply confirm the 'reality' of the modeller, i.e. models mediate, within the conceptual framework of the modeller, the relationship between computer systems and the world. Basic cognitive frameworks are not something that can be dispensed with, even if expertise in another domain is acquired. These frameworks influence choice of methodologies and each of these is characterised by particular selections of systems types, data or people orientations. They are also characterised by bias towards or away from computerisation. Particular philosophical commitments underpin this. These commitments influence all of the key principles underlying any methodology and, in taking a particular view of 'reality', influence the view available to and reproducible by users.

Having selected an approach or approaches to systems development, a further influential factor rests in their application. However, as noted by Fetzer (1996) systems

developers are very often not expert in problem domains. Experts are usually most competent in their own domains. As noted by Dreyfus et al (1986):

‘.... every step of the conventional mathematical modeling process requires that the expert informants, whose expertise is supposed to be captured in the model, provide the sort of decomposed, decontextualised information that concerns beginners but not true experts. Hence, to participate in the construction of a model an expert must regress to seeing the world like an advanced beginner, or in some cases a novice. If ‘user’ experts fail to appreciate the extent and importance of their unrationalised ‘know-how’, they may not realise how seriously their own understanding is being degraded, they may even be flattered into thinking that the model constructed on the basis of their answers captures and amplifies their expertise. If so, and they act on the basis of the model, business and social decision-making will suffer.’ (Dreyfus et al, 1986: 177)

Indeed, it could be argued that the strength of the paradigm hosting computers and computer data is such that their contents are often taken to be ‘true’.

These observations draw on the work of Dreyfus et al (1986) studying the learning process in humans to ascertain how far digital computers can safely go towards apparent ‘intelligence’. This built on earlier work (Dreyfus, 1985) in which he argues that, for a relatively new discipline, AI reflects affinity to a surprisingly ancient philosophical stance. This started with Plato’s separation of the intellect or rational soul from the body with its skills, emotions and appetites. It was continued by Aristotle when he separated the theoretical from the practical and defined man as a rational animal, on the assumption that one could separate man’s rationality from his animal needs and desires. Dreyfus argues that this assumption is unproven. He also argues that it remains at best highly implausible if one thinks, for instance, of the development of our sensory-motory skills as we learn to recognise and cope with objects, or the role of needs and desires in structuring all social situations. He goes on to assert that the idea that we can simply ignore both this ‘know-how’ and contextual phenomena while formalising our intellectual understanding as a complex system of facts and rules is highly questionable.

In the later work discussed above (Dreyfus et al, 1986) five stages are identified: novice, advanced beginner, competence, proficiency and expert. The novice is usually

working on context-free information, i.e. not referring back to experience but learning by rote. The expert knows what to do on the basis of mature and practiced understanding, with skill that is so much a part of them they are almost unaware of it. Dreyfus argues that this shows a progression from the analytic behaviour of a detached subject, consciously decomposing his environment into recognisable elements and following abstract rules, to involved skill behaviour based on holistic pairing of new situations, thus going from exercising no judgment to exercising judgment. In terms of systems development, what this work indicates is an assumption that the user 'domain expert' is someone who possesses and, more importantly, can articulate 'know-that' knowledge and also 'know-how' with respect to how those beliefs became accepted within that domain.

Work by both Dreyfus (1986) and Giddens (1976, 1984) refutes this. When discussing the consciousness of the acting subject they assert that much of human knowledge is, in fact, held by some to exist on a tacit basis. Work in the field of KM by Scarborough et al (1999) and Nonaka (1994) further supports the existence and importance of tacit knowledge, asserting that it forms part of the background of shared assumptions on which culture is founded and as such cannot be articulated. This led the researcher to the conclusion that, if this was the case, and if systems experts lacked proficiency in the problem domains of others, it was questionable whether such knowledge could ever be comprehensively captured.

Further support for this conclusion was found in work by Gardner (1998) again in the field of KM. He asserts that one of the problems he perceives is that KM assumes that all knowledge is codifiable, which it clearly is not. Thus, it might be argued that the selectivity inherent in philosophically derived representations of reality can be compounded by the inherent inability of individuals, no matter what their philosophical preferences, to know and articulate all that is relevant. Far from being scientific this makes programmes, programming and programming languages social constructs, in the same way as the earlier models, and in the same way as the underpinning philosophy that they reflect. Thus, apparently, this was an example of science using social methods to negotiate reality.

This found further support in Leith's work (1987) on programming languages, in which he observes that these are considered traditionally as being dependent purely upon technical matters, such as speed of compilation, or execution. However, he also argues that the design of programming languages is not determined purely by technical matters, but also by social features. Both Leith and Smith (1985) argue that programming languages, like systems research, design and development methods, often represent our "involved" or particular views of how the world actually is, e.g. the belief that it is logically ordered.

Thus far this discussion has focused on the effect of models in shaping the reality reflected in computer systems (Pettigrew, 1972, Markus, 1983). Another description of this is 'bias'. Exploration of modelling from that perspective revealed interesting additional insights provided by Friedman and Nissenbaum (1996) who offer an alternative, but related schema in this context. Their paper uses the term 'bias' in the sense of a system that systematically and unfairly discriminates. The example of bias quoted is that of an airline reservation system that searches for available flights. The inherent bias here was in the algorithm controlling the search and display functions. This gave preference to flights where all segments were on a single carrier, thus ranking lower any where more than one airline was used for a journey. This was considered to be relevant because user interfaces also reflect underlying models of problems and solutions and, as discussed above, models can be highly influential. From an analysis of cases, three categories of bias in computer systems were developed. These were preexisting, technical and emergent. Preexisting bias was considered to have its roots in social institutions, practices and attitudes. This bias was seen as entering the system either through the explicit or conscious efforts of individuals or institutions, or unconsciously in spite of best intentions. This implicitly alludes to the issues surrounding systems developers and users as developers. It also perhaps widens the discussion to involve both the relationship of individuals to organisations, and the place of information in that relationship. For instance, the paper notes that the interface design on the above-mentioned airline reservation system means that information is displayed in screens of two to five flight options. The advantage of having flights

shown on the first screen is enormous, as 90% of bookings are made from the first display.

Because all digital computers have a user interface it was considered possible that this may have relevance to some healthcare systems. It was certainly relevant to some hospital PASs. ICD-10 and OPCS-4 were either resident on PASs or on systems interfaced with them. As a result of the lack of a global purchasing policy, a number of different models of this software system were in use across the NHS. These variations affected a number of factors, including the order of presentation of screen and fields, and the type and level of behind-the-scenes data manipulation undertaken by resident programmes before transmission to the central database. This was not always transparent to users. So, for instance, many PASs held a resident validation programme for clinical data. Although a national validation file was available, research showed that local files were often written. This was in addition to any validity file installed by the supplier, which may or may not have been in accordance with the national file. The kinds of impact these files could have included ordering of the data entered, allowing certain kinds of data and disallowing others, and allowing or disallowing certain combinations of data.

In addition the technology can engage and extenuate bias making it difficult to spot or remedy. This was again the case with some PASs. There was a requirement when using clinical classifications for specific data to be entered in specific fields. For instance, according to the rules of ICD-10, a first field containing the classification code for an accident, e.g. 'fractured skull', must always be followed by the relevant code for the cause of the accident where known, e.g. 'motorcycle collision'. In the previous revision of the ICD, ICD-9, these latter codes were identifiable by their unique prefix of the letter 'E'. Some PASs automatically removed this 'E' and replaced it at the end of the code. Analysis programmes designed to investigate causes of road traffic accidents would routinely miss such data in their calculations, if they selected relevant data by searching for all codes with a leading 'E'.

Friedman and Nissenbaum (1996) describe technical bias as coming from technical constraints or solutions, including computer tools, i.e. bias that comes from a limitation of the computer technology, including hardware, software and peripherals. It was also seen as coming from attempts to formalise human constructs, e.g. when attempts are made to quantify the qualitative or discretise the continuous or formalise the non-formal. The possible relevance of this notion to clinical data processing systems again became apparent.

Lastly, Friedmann and Nissenbaum (1996) describe what they call 'emergent bias'. This arises in a context of use, typically some time after the design is completed, and can be a result of changing requirements, environments, or poor design. User interfaces are a particular problem here because, by design, they seek to reflect the capacities, character and habits of prospective users. This once again reflects on the conceptual preferences of modellers, but also again widens the discussion to the context of use having an effect on information.

Computers, as argued by Winner (1985) are, therefore, political. They are:

'.... a convenient means of establishing patterns of power and authority in a given setting.' (Winner, 1985: 36)

Bijker and Law (1992) concur and provide a useful summary of the above discussion:

'.... *all* technologies are shaped by and mirror the complex trade-offs that make up our societies; technologies that work well are no different in this respect from those that fail. The idea of a 'pure' technology is nonsense. Technologies always embody compromise. Politics, economics, theories of strength of materials, notions of what is beautiful or worthwhile, professional preferences, prejudices and skills, design tools, available raw materials, theories about behaviour of the natural environment - all of these are thrown into the melting pot whenever an artifact is designed or built.' (Bijker and Law, 1992: 3)

All of this inevitably has philosophical ramifications. Dreyfus et al (1986) argue that if the persistent difficulties that have plagued all areas of AI are reinterpreted as failures, these failures must be reinterpreted as empirical evidence against the epistemological

and ontological assumptions themselves. As discussed earlier, these assumptions underpin the application of computers to clinical knowledge.

Shanker (1987) also dissents from the AI philosophy, but not to the extent of questioning 'sub-AI' systems. In his contribution to the debate on AI, he describes his belief that AI is founded on a Mechanistic thesis. He perceives an implicit scientism in AI that he considers to be a misguided attempt to pursue empirical solutions to purely philosophical problems. These criticisms reinforce the basic philosophical approach of this research. This is not to say that the scientific paradigm has no validity in exploring real-life phenomena. As discussed by Dreyfus et al (1986) the difficulties in AI, rather than reflecting technological limitations may reflect the *limits*, and not a general invalidity, of the technological or scientific paradigm. This is particularly so when one considers, as mentioned above, the original design purpose of digital computers was scientific calculation, for which they may have been absolutely valid. The extension of their success in that field, and their availability and utility, has been pervasive, and many computers now handle more sophisticated transactions that are very different in nature. The limits to which such technology can reliably be taken in valid representation of any level of human knowledge do not appear explicitly to have been measured. They look as if they are doing the job. However, as argued by Davenport (1997):

'The same attributes that make computer-based information easy to load into the computer, and easy to manage once it is there, make it less valuable to humans what we get from computers is usually dated information with little or no context or clues to meaning, devoid of sequence or causality' (Davenport, 1997: 26)

Weizenbaum (1985) concurs:

'For example, when a computer executes an instruction to add 2 to 5, it computes 7. But one cannot infer from '7' that it was the result of an addition, let alone that two numbers were involved. That information is lost in the performance of computation.' (Weizenbaum, 1985: 94)

In examining these effects in a case study environment, this research was able to shed more light on this significant issue.

Omission of much contextual data was believed by the researcher to have another important aspect. The literature reviewed suggested that the 'meaning' that underpins information is contextually situated and derived. Faced with contextless data users are free to, and indeed must for sense-making purposes, ascribe context from their own frames of reference. The consequence of this is the development of user-defined meaning, which may differ significantly from the original. According to Davenport (1997) the problem for organisations, of multiple meanings for the same key units of information, is not a new one:

'When a group of people try to create categories or lists of information to be used by others, there have always been problems in the maintenance of meaning.'
(Davenport, 1997: 96)

Davenport goes on to give a clinical example of direct relevance to the research:

'Since the nineteenth century, international medical bodies have attempted to classify types of disease (one such classification is the International Classification of Disease), while individual physicians and country-based medical associations decide these categories don't work for their purposes and so modify them or create new ones.' (Davenport, 1997: 96)

Davenport is right. Both America and Australia have added new categories to this basic classification in order to make it usable by them. Davenport's work is oriented towards industry and not the public sector. In his view multiple meanings can be a good thing, in terms of representing innovation in a business. However, what his work does not address is the fundamental relationship between any of these categories and medical knowledge, nor does it take account of the implications of unnoticed change in meaning.

An additional problem, alluded to above and noted by Wood (1981) concerns the problem that:

'.... the power and convenience of automated information collection and distribution has had the effect of driving out information that does not lend itself to quantification.' (Wood, 1981: 17)

The practical implications he observes include the fact, for instance, that the CIA:

‘.... whilst coping well with crop acreage and tons of steel produced, had a fairly thin record in judging political and social stability, so improved access to ‘hard’ data may produce over-confidence in the level of understanding about the real basis on which an economy functions.’ (Wood, 1981: 17)

The CIA’s interpretation of the data, in the social context within which they operated, produced a ‘reality’ and one that was promulgated widely. Given the above discussion, it was considered possible that parallels may exist with the DH.

All of this indicated that what is included, and how it is included, in the software of a digital computer is characterised by at least two dimensions. The first involves the kind of scientific assumptions that are consistent with the *medium* of reality representation: the computer (but not necessarily with the reality computers seek to represent). The second involves the social methods by which they are arrived at. Computer software, therefore, is not a neutral issue in considering perceived transformation of knowledge and data, where at least some of that knowledge and data is thought not to be objective.

4.4.2.c Digital Computers, An Initial Summary

It was considered possible that a type of transforming reification might have been taking place, making it necessary to examine the nature of the knowledge underpinning computer data. It was also possible that the model had been allowed to become reality. Consequently, rather than using the output of models to support improved understanding of reality, notions of reality were adjusted to fit what the model described.

Key questions to be addressed, then, included whether there was a definable point at which certain types of ‘knowledge’ were not amenable to the empirical lense. They also included whether this was only ‘qualitative’ knowledge and, if so, what defined qualitative knowledge. Was the point only reached in the realms of AI, or were AI

practitioners merely recognising knowledge types of which earlier systems designers were not aware, due to the lack of sufficiently testing applications? Also, could knowledge be divided in this way, or was it the case that knowledge was an integration in which 'fact' was only fact because of the contextual landscape within which it was perceived and received? If so, and computers excise original context, were users ascribing context on the basis of their own frames of reference? Was the model becoming, or defining, reality as a result of this process? Again, what may have been happening was the quantification of qualitative data, the transformation of one kind of data to another, without regard for the impact on the content and meaning of that information, and the wide promulgation of a 'reality' which was removed from the real basis on which the NHS was operating.

4.4.3 Statistical Classifications and Coded Systematised Nomenclatures

This section begins with a review of statistical classifications, with a view to gaining relevant insights to the NHS classifications, ICD-10 and OPCS-4. It then moves on to systematised nomenclatures, in relation to Read 3. Some earlier references to systems are again briefly included here where it is felt they enhance this discussion.

4.4.3.a Statistical Classifications, A Description

As described earlier, a statistical classification is an arrangement of concepts into classes and their subdivisions, expressing the semantic relationships between them. Such systems work in a top-down, goal-oriented manner and are primarily population-oriented. Within them criteria for subdivision are clear, and the division is exclusive. The criteria used for subdivision of classes reflect the classification's purpose. What can be said about instances of interest is predefined, with a desired granularity, dependent on that purpose. They are designed so that, when populated with data, class frequencies do not differ too much from an equal distribution in some sort of reference population. They are also designed to inform decision-making about given domain areas by enabling:

‘.... the systematic recording, analysis, interpretation and comparison of (real world) data.’ (WHO, 1993:2)

It can be argued that the first three of these activities supports the fourth. Valid comparison relies on consistency and stability across all observers. Great emphasis is, therefore, given to the standardisation of procedures for data collection. If measurements are reliable in this sense, it is argued, they are stable across all observers. They provide, therefore, a sound, theoretically neutral base upon which to build and make decisions. Thus, standardisation mechanisms seek to ensure reduction, to a minimum, of inter and intra human variability, and of ambiguity in the use of language. This is because language is recognised as ambiguous and several meta-instructions are deemed necessary to fix meaning more precisely. Such classifications have, therefore, myriad rules about what can be described using such an instrument and how it must be described. For instance, classes within a classification are designated by rubrics, giving the user an idea of what should be included in the class. Thus in ICD-10 and OPCS-4 rubrics can be taken as instructions to a user to interpret what is written in the medical casenote and to judge whether a clinical statement should be assigned to a given class.

Statistical classifications purport to be exhaustive, i.e. they claim to be complete models of their structured domains. However, they give only a limited kind of completeness and, although described as ‘exhaustive’, they are not, in fact, complete models of their domain. They reflect only partial knowledge of certain aspects, hence the existence within them of concepts such as ‘not’ or ‘not known’. This characteristic partial completeness is based on two things. Firstly, earlier discussions about the capability of models to express reality are relevant here (Jayaratna, 1994, Leith, 1987, Friedman and Nissenbaum, 1996). Secondly, they are primarily population-oriented. The classes generally intentionally subsume levels of detail considered unhelpful to the classification’s purpose. This is because either they represent phenomena of little interest or they would result in frequencies in classes being too few for reliable statistical extrapolation.

4.4.3.b Statistical Classifications, A Discussion

Statistical classifications reflect the commitments of the positivist, scientific tradition. Such systems are an attempt to formalise large and complex areas of the natural world, on the assumption that real world phenomena are amenable to such treatment. This realist perspective holds reality to exist in the empirical world, and to be discoverable by examination of that world. It also assumes a shared reality. In terms of their philosophical underpinnings, classifications reflect the prioritisation of phenomena that are directly observable. Any appeal to intangibles runs the risk of being dismissed as metaphysical speculation. This perspective argues, therefore, that scientific theories must be founded upon, or tested by appeal to, descriptions that simply correspond to the state of the world, involving no theoretical assumptions and, therefore, being beyond doubt. Ayer (1936) argues that only empirically verifiable knowledge makes any sense at all. The foundation of scientific theory could be sense data, as in traditional empiricism, or it may be in the realm of the 'publicly observable', for example, blood cell counts, which are easily agreed upon by all observers. For the research this immediately raised the question of how valid classifications might be in less explicit contexts, e.g. that of some clinical data, like for instance 'abdominal pain'. As noted by Kilpatrick (1973):

'.... it is this subjective aspect of healthcare that leads many to maintain that the computer will never replace the physician in diagnosis.' (Kilpatrick, 1973:1-2)

However, this does not stop a sense of 'completeness' or certainty being attached to knowledge generated about a domain in this way. As noted by Davenport and Prusak (1998):

'Codification gives permanence to knowledge ...'(Davenport and Prusak, 1998: 87)

This is an important insight, but it does not consider whose knowledge is made permanent. Review of classifications in action revealed that, despite the number of standardising mechanisms, classifications could also change meaning. This was particularly so where they were applied as secondary instruments, as was found to be

the case in the NHS. As with computers, this might again be perceived as a philosophical commitment that, rather than reflecting reality, makes it fit what it expects by 'smoothing' and 'shoehorning' data into the desired formats.

Turning now to their context of use in this research, this has been shown to be informationally disparate domains. Thus, the collector and user did not share the same knowledge of the domain of interest or of the classifications. In other words, users of the classified data did not hold the necessary contextual knowledge that the classification excised. Here, classifications were applied by non-clinical operatives to an already existing clinical perspective on some aspects of clinical reality. Selection of data elements had, in this context, already been made by the clinician, and for purposes other than those of the classification. Information loss is a part of classifying, even where reality itself, in all its completeness, is the data source. Where the data source is already selective, information loss can be greater. This raised doubts about the degree of fit between the original clinical observations and the output of the classifications that were applied to them. It also raised doubts about the classifications as media of data collection. This issue was explored by reference to work by Tiles (1989). This work relates primarily to how, or in what circumstances, it is legitimate to extrapolate from observed data:

'Since the process of data collection, the making, recording and processing of observations is, in any scientific discipline, governed by standardised procedures, those procedures themselves contribute to the form and content of the observations. But they embody socially established and enforced standards, they are not dictated directly by nature, but by people's beliefs about the best way to go about getting information of a given sort, given the technological and other resources available to them, and given their very general beliefs about the nature of the field concerning which they want further information. This means that the methods of making observations are not themselves beyond the reach of critical appraisal.' (Tiles, 1989: 36)

This issue does not stop simply at information loss or transformation of meaning. Having been developed and put in place these classification categories can be impressively robust. They become official and, subsequently, increasingly 'real'. In the NHS, legions of statisticians were collecting and processing numbers on the assumption that the categories in the classifications were valid, and this use, in itself,

validated them. Their robustness was further bolstered by the fact that users, particularly in an organisation as distended and fragmented as the NHS, had very little ability or reason to work the numbers backwards to their origins. This helped these categories to become 'black boxes', vulnerable to challenge by only a limited number of insiders, if any. Thus, as Porter (1995) observes:

Public statistics are able to describe social reality partly because they help to define it.' (Porter, 1995: 43)

This is despite the fact that, as also discussed by Porter (1995) the underlying statistical categories can be highly dependent upon particular circumstances, and are hence weak. Supporting evidence for this was found in the research domain. Anecdotal evidence suggested that all of the classifications studied were unbalanced in terms of the level of detail allowed by categories for a given specialty's work. For instance, Cardiovascular and Orthopaedic surgeons engaged in vigorous lobbying when OPCS-4 was in development. This resulted in more detailed descriptive labels and classes than was found in other specialties. Logically, in terms of the purpose of the classification, fewer, less detailed categories would have sufficed or even been more useful.

Even so, as Porter notes, the process of reification is robust. He explains this by describing the emergence of the notion of 'cadres' in France. In 1930 this was an unknown concept and, consequently, nothing was described in that way. The term was then applied to engineers and managers under the Vichy Government, following which it became a category in official statistics. The category required tight definition so members could be counted accurately, and soon attracted a range of numerical characteristics. Now it is common to hear and read about what 'cadres' think about current issues, how they dress, etc. Thus, as Porter (1995) notes:

'.... increasingly the statistical categories become the basis for individual and collective definition.' (Porter, 1995: 43)

In that sense statistical classification categories and the statistics based on them attain 'reality'. They become part of the known landscape and, in that way, begin to inform notions of what constitutes reality. This observation was coupled with the

characteristics attaching to computer data generally. The resulting picture was one of data socially located firmly in the realm of objective, definitive fact about reality.

What was considered important here was that the clinical reality at issue had already been defined at the stage when the clinician engaged with it. As a result of the classification process some of that information was likely to have been lost or changed or both. The resulting statistical data, however, was what achieved factual status in broad society. As mentioned above, this view coalesces with insights stimulated by Giddens' work (1976, 1984) on Structuration Theory. Classifications set the parameters of what can be known and how it can be known and, in a sense 'spotlight', and even 'create', certain phenomena to the exclusion of others. This was usefully explored further by considering the effects of these issues on users of such data. For NHS statisticians and managers this data had validity, validity here being used in its most rudimentary sense, which draws upon its Latin root, meaning power. Where categories represented clinical work they became the basis for socially accepted notions thereof, and for actions taken on the basis of those notions. Indirect evidence of this was found in the promulgation by these groups (DH, HES, managers, Ministers) of the representation of the NHS defined in coded and classified clinical data.

4.4.3.c Statistical Classifications, An Initial Summary

Statistical classifications are reductionist instruments underpinned by the positivist scientific tradition. This considers complex areas of reality to be describable in structured, atomic data. How well this assumption worked in the field of clinical data was explored in the field research stage. However, the literature review already indicated a lack of fit between some clinical observations and the real world assumptions evident in classifications. Some indication that a conflict might exist was found in the way in which statistical classifications enforce rigorously standardised data collection procedures, in order to ensure reduction, to a minimum, of inter and intra human variability, and ambiguity in the use of language. No allowance is made for the possibility that this is inappropriate to certain kinds of real world phenomena, or at least inappropriate to the level of understanding of those phenomena that was held. Indeed

the assumption was that standardisation 'neutralises' and provides, therefore, a sound base for decision-making, as though variance is a contaminant rather than an inherent and essential ingredient of real life.

In addition, statistical classifications are designed to select only that type and level of detail that is deemed relevant to their design purpose. They lead, therefore, to further information loss. Also, the number and nature of categories in these systems are, at best, pragmatic. This reflects the need of statistics for sufficient data in each class from which to generalise. It also sometimes reflects vested interests. This does not stop a sense of 'completeness', 'realness' and objectivity being attached to knowledge generated about a domain in this way. In this way public statistics could be seen to describe social reality partly because they helped to define it. In addition, once created, classification realities have a way of not only defining social reality, but also of influencing human action within that frame of reference. Thus, in the context of the research, they were possibly perpetuating a cycle of misrepresentation and misguided action.

4.4.4 Coded Systematised Nomenclatures, A Description

As this section is relatively brief and refers in large part to the above discussion on statistical classifications, it is not concluded by a summary of the key discussion points.

Coded systematised nomenclatures were of interest to the research because one of the systems operating within the problem domain was Read 3. Although not yet in widespread use in the NHS, it was in use, albeit on a very small scale, in the hospitals visited as part of the field research, and it looked likely that usage would grow. The Government's Information Management and Technology strategy (DH, 1997b) indicates the need for NHS hospitals to use a clinical vocabulary in clinical systems, and recommends Read 3 as the preferred one.

The purpose of such systems is basically to support the efficient and easy collection, storage, retrieval and manipulation of data in order better to address some relevant task

or tasks. In the case of Read 3 the task is delivery of care by clinicians in patient consultations.

Coded concept systems, like computer systems and statistical classifications, and all such representational systems, are aimed at knowledge organisation by representing the natural world in data elements and pre-defined relationships. The philosophical underpinnings of all of these systems are, therefore, consistent. Formalised concept systems, like Read 3, purport to lean towards an 'open world' assumption. All knowledge about individuals is considered as partial. Partial knowledge can be extended with the next piece of knowledge.

In terms of their explicit characteristics, a coded systematised nomenclature is a collection of linguistic terms assumed to represent non-linguistic, abstract concepts, to which codes have been attached. Read 3 contains hundreds of thousands of coded clinical terms, catalogued by clinicians, and reflecting the words they normally use to describe their clinical work in everyday care of patients. Rules for system use do not exist, beyond the technical demands of any host software. Explicit definitions of terms also do not exist. Thus in Read 3 users are free to work with the nomenclature terms in the contexts of their own frames of reference. In other words, they are free to assign a term to an observation as they see fit. As with spoken language, meaning is, therefore, initially defined in the primary context by the clinical observer.

To an extent, therefore, systematised nomenclatures impose less of an explicit framework for use than statistical classifications. (Interestingly, these characteristics have been a key factor in the rejection by the DH of Read 3 data as a substitute for classified data. Even more interestingly, no such problems are perceived with ICD-10 and OPCS-4 data. The inherent similarities of the systems are not recognised.) Freedom and naturalness are, however, constrained by the desire to adhere to a particular structure, by resources and by the particular view of the world this represents, which has been extensively discussed earlier. In addition, like classifications and, arguably, digital computers, nomenclatures are standardising mechanisms, even where users are allowed involvement in their on-going development

and growth, as is the case with Read 3. Experience has shown that some users get used to the terms in a nomenclature and begin using them in preference to personal variants, thus standardising their language. The broad contents of the system also influence what individuals think about when deciding what to explore and record.

4.4.4.a Coded Systematised Nomenclatures, A Discussion

These systems differ from statistical classifications in a number of respects. They do not impose statistical categories or any associated explicit rules about data collection, or even language, providing it is relevant to the domain of interest. It would seem, therefore, that the potential for changing meaning is vastly reduced where these systems are applied within their legitimate context. Two issues remain however. Firstly, there is partiality. Coded systematised nomenclatures are formalised concept systems and, as such, are aimed at knowledge organisation and at representing the natural world in data elements. They are, therefore, a gravitation towards the extreme of AI and maintain all of the philosophical assumptions, capabilities and limits associated with that paradigm in relation to real life phenomena. They seek *better* to represent the richness of the real world although, like classifications, they make no attempt or claim to fully capture it. The same denial tends not to attach to data collected through such systems when used outside its original context. Secondly, lack of definitions and usage rules must carry an implication for meaning. Such freedom can mean a high level of context dependency where stability of meaning is concerned. In this context, therefore, meaning cannot be assumed to be stable, on both an inter and intra user basis. This was considered to be particularly relevant in the context of the research problem. Read 3 was used by clinicians to capture what they considered to be clinical details relevant to patient care in 'natural' clinical language. However, the full richness and diversity of clinical language had not been captured, and Read 3 was, therefore, acting as a standardising mechanism. It was also a standardising mechanism in that its content was based on an explicit model of clinical work, and the need to handle this in a computerised environment. Standardisation progressed when this data was then semi-automatically processed through statistical classifications. Thus, the

heterogeneous was standardised and attracted all of the qualities ascribed to 'scientific' data.

4.4.5 Statistics

Three of the systems in the problem domain: ICD-10, OPCS-4 and HRGs, were specifically designed to produce statistically useful information for the NHS. The subject area of statistics warranted, therefore, consideration in its own right. As discussed earlier, statisticalisation has the effect that public data from such systems achieves a powerful status in society, in which it can shape perceptions of that society and actions in relation to it. This area was also reviewed in order to gain insight into the perspective of statisticians on the type of data they required for their work, and assumptions they held about the data. This was important from the perspective of comparing those characteristics against the characteristics that emerged from clinical information when examined at the clinical interface.

4.4.5.a The Discipline of Statistics, A Description

Statistics is, as noted by Johnson (1988):

'.... more than just numbers - it is what is done to or with numbers.' (Johnson, 1988: 4)

He goes on to define statistics as:

'... the universal language of science (it involves) information, numbers to summarise that information, and their interpretation.' (Johnson, 1988: 4)

Johnson also describes the events, and their sequence, necessary for the application of statistics:

'(1) the situation investigated is carefully and fully defined,(2) a sample of data is collected from the appropriate population following an established and appropriate procedure, (3) the sample data are converted into usable information and (4) the

theories of statistical inference are applied to the sample in order to draw conclusions about the sampled population.' (Johnson, 1988: 1)

For the statistician the value of the reduction of information depends on how representative the resultant statistics are of the population of interest. The accuracy of the extrapolation from the sample to the total depends on the representativeness of the individuals examined. Typically, this involves ensuring that data, for instance, about the national prevalence of a disease, is not drawn from one geographical area. The issue of how representative the data is of the clinical 'reality' captured by the clinician is not challenged.

The statistics at (3) are descriptive statistics, those at (4) are inferential. In the context of this research, Government statistical tables may be termed descriptive. The use that is made of these figures in terms, for instance, of predictions about healthcare, is inferential.

As described in the section on statistical classifications, the kinds of data statistical systems require are collections of objective fact to support production of predictive averages. As noted by Kilpatrick (1973):

In statistics we are interested not in the single fact.....but in collections of objective facts...' (Kilpatrick, 1973: 3-6)

4.4.5.b Statistics, A Discussion

Several important points are inherent in the above description. Firstly, according to Kilpatrick (1973) the discipline of statistics has an innately pragmatic, rather than a purely objective basis:

'.... the statistical method has been introduced precisely because the power of the human mind to grasp a number of particulars is limited.' (Kilpatrick, 1973: 6)

Secondly, statistics relate to the population and not to the individual. This data can then be used for planning and control purposes. Staying with the issue of averages, it is a tenet of statistics that:

‘The most important characteristic of healthcare information is variation, patients differ, illnesses manifest themselves in different ways, costs increase this variation itself is apparently governed by certain laws All healthcare information varies with respect to some norm or average. If we can deduce from a set of data, where each reading represents an individual patient, what the ‘average’ experience of these patients is and also describe the observed variation about this average then we shall be in a better position to interpret future data of this nature than we would without this overall view We can use these bodies of information to predict the characteristics of single future items....’(Kilpatrick, 1973: 3)

Also, as discussed by Porter (1995):

‘The regularities of crime and suicide in early investigations of ‘moral statistics’ could evidently not be attributed to the individual’. (Porter, 1995: 37)

In terms of the research problem this was considered to be important. Clinical data at the clinical interface was, and clearly had to be, oriented towards individual patients. That is not what statistical systems are about. They can be populated with individuals’ data, but only in order that a focus can be placed on the entire population. Importantly, however, that focus on the population can lead to conclusions that ultimately affect the individual. As argued by Dreyfus et al (1986):

‘Every case is unique, so statistics about likelihoods of outcomes of various possible treatments based on all previous cases are of little value. the frequency with which a particular procedure yielded a particular outcome observed in all previous sufferers from a disease or injury differs from the statistics for victims of the patient’s age, sex, general health, mental outlook and so on, and there is no scientific way of knowing what reference group should be taken as relevant. In reality, a patient is viewed by the experienced doctor as a unique case and treated on the basis of intuitively perceived similarity with situations previously encountered. That kind of wisdom, unfortunately cannot be shared’ (Dreyfus et al, 1986: 200)

It is interesting to note, particularly given the assertions of Kay and Purves (1996) Kluge (1996) De Dombal (1996) and Dreyfus et al (1986) that in essence each

clinician/patient encounter is inherently heterogeneous, when the view from the statistician is that:

‘Healthcare is based on the fact that to a certain degree people and their diseases are alike, in spite of individual differences.’ (Kilpatrick, 1973: 9)

Thirdly, a numerical item of information is called a statistic. This rather obvious fact is important for two reasons. Firstly, anything that cannot be quantified cannot validly become a statistic. This may be taken to mean one of two things. Either ‘qualitative’ data does not exist, or ‘qualitative’ data exists but is not deemed by statisticians to be viable for statistical purposes. As asserted by Kilpatrick (1973):

‘.... the two least accurate forms of information on which to estimate a population value are the single fact and the subjective impression Impressions are (also) suspect in that they usually conform to the general attitude of the person holding them and involve subjective judgments or criteria not generally acceptable.’ (Kilpatrick, 1973: 8)

The ‘single fact’ problem is overcome by mass data collection. Closer inspection of this assertion, however, raises questions about the statisticians’ view of what is quantifiable, particularly when bearing in mind the paradigmatic location of statistics. Thus, while it might be argued that attaching a number or code to qualitative data is not the same thing as starting with quantitative data, no assumption was made within this research about what constitutes quantitative data for an individual with this philosophical stance, particularly when this stance is directed at the realm of medicine, which is also widely considered to rest within the scientific paradigm. Nor was any assumption made about the inherent validity of the possibly inappropriate mix of methods and data.

In addition, it is worth noting that subjective opinion has what can arguably be described as a more ephemeral, transient and uncertain nature than what is taken to be objective information. Numbers have a fixed meaning. Attaching definitive labels to opinion data immediately fixes the transient meaning at a point in time. As noted earlier, codification lends permanency. Fixed meaning is a fundamental characteristic of objective data. However, it should be noted that in the research this fixity was

imposed rather than real. This was not, however, always evident and it may have been the case with healthcare data that there was an assumption that anything that had been assigned a number actually representing a definitive label was objective, and that if only there were bigger and better numbering schemes, management decision-making and ability to control events would improve.

Turning now to the relationship of such a tool to clinical work, insights were gained from Felligi (1996) and most particularly from Kilpatrick's (1973) discussion about statistical principles. In this he focuses directly on healthcare. He does not apply this to a critique of live systems, but he describes the information needed by statistical healthcare systems. This is, he asserts:

‘.... objective, unemotional facts which can be checked by other people (auditors, physicians) and which can be communicated (much like the data needed by computers). For example, to say a person is cyanotic implies a personal judgment on what constitutes cyanosis (lack of oxygen) but the statement that the blood is elevated can be made more precise by quoting the systolic and diastolic blood pressures, the method of recording these and the norm or control values used’ (Kilpatrick, 1973: 1)

Notably he goes on to extol the virtues of subjective information:

‘.... it is this subjective aspect of healthcare that leads many to maintain that the computer will never replace the physician in diagnosis.’ (Kilpatrick, 1973: 1-2)

This was considered highly relevant to previous discussions about clinical knowledge and the content of the clinical casenote, which was the source of information for the classifications in the problem domain.

4.4.5.c Statistics, An Initial Summary

The discipline of statistics comes from the scientific paradigm and is the science of collecting, classifying, presenting and interpreting data. It has been shown to be a pragmatic attempt to overcome the inadequacies of the human brain to deal with certain levels and types of complexity. Its products have been shown often to be socially

received as fact. Where statistics are applied to real world phenomena the limitations as well as the strengths of its underlying philosophical characteristics emerged, therefore, as worthy of examination. These characteristics might, for instance, be argued to fix meaning where stability is not proven, and thereby change it. This assertion was based on evidence from the literature, which included observations that single facts and subjective impressions are not deemed valid for statistical purposes, and yet every clinical case is unique, making existing statistical extrapolations defective. The consequences for the research domain of the belief system surrounding statistics was further explored in later stages.

4.4.6 People

The issue of people in the context of the organisation has been discussed, to an extent, in chapters 1 and 2. However, this section draws particularly on those areas of conceptual work which offer insights into people as professionals. As earlier discussions have shown, professions can exert significant influence over the relationship of their members to organisations and can, therefore, be argued to influence behaviour. It was thought likely that this influence on behaviour extended to informational issues. Findings here were used to explore the profession of medicine.

In addition, potentially significant factors with regard to non-professional groups: managers and Ministers, are discussed here. Discussion of statisticians, in terms of their worldview, is implicit in the above discussion and is not, therefore, repeated in a separate section here. Other significant aspects of this group are discussed as part of the fieldwork report. Also reported there are key characteristics of the one remaining group deemed to be active within the problem domain: clinical coders. This group was not addressed here as it is not represented in the available literature.

Unlike previous sections in this chapter, this entire section is presented as a discussion, followed by an initial summary of key points.

4.4.6.a People as Professionals

Key amongst the influential characteristics of professions are the social arrangements which surround them. These are such that outsider ability to know or challenge the 'realities' constructed by professionals is minimal. Examples of this include emphasis within the professions upon the 'unfettered' one to one relationship of professional and client. This is initiated by the 'inexpert' consumer but terminated by the professional. This is the only setting within which it is deemed expert diagnosis of the client's problems can take place and be successfully carried through. This relationship is given pre-eminence by professionals who need to have their expertise taken for granted. Another example is the degree and type of expertise needed in order to qualify in the professions. As discussed in chapter 2, this means no outsider possesses the competence to judge practice and no insider needs to, because practice is evidence of expertise and also a matter of judgement as well as skill. This was important in the context of this research, not least because peer validation of expertise meant that standardisation of practice for the purposes of achieving external credibility was unnecessary. Also, where the key entities at issue resist precise quantification, or as some would see it, objectification, trust fills the gap.

That the advice was expert in nature was not lightly treated. As noted by Johnson (1972):

'.... knowledge provides a powerful control over nature and society.' (Johnson, 1972: 33)

As Barnes (1977) notes, it also follows that only practitioners fully understand the implications of their own practices, so it follows they will be allowed the dominant role in controlling their application. It must be assumed that this means direct application, for in the case of healthcare, for instance, its data and apparent knowledge about it is applied by non-experts in the field. This is an interesting paradox, because the combination of expertise, which to an extent makes professional knowledge a 'black box' to lay people, and social power, not only buttresses what might be described as 'ontological protectionism', but also facilitates manipulation of the nature of

professional knowledge for purposes of public presentation. This 'sword' is, however, double-edged. It also supports either intentional or unwitting manipulation and misrepresentation by groups outside the profession.

The control enjoyed by professions is also typically and powerfully fortified by language (Bernstein, 1971, Johnson, 1972). Johnson (1972) discusses this in the specific context of medicine, referring to it as:

'.... a highly developed community language or jargon Few lay people can intuitively understand legal or medical language.' (Johnson, 1972: 56)

This enables clinicians to transfer knowledge amongst them:

'A major factor in the success of any knowledge transfer project is the common language of the participants. Sharing almost identical training and experience, working in precisely the same specialised area, the surgeons and other professionals could readily understand one another's words and actions.' (Davenport and Prusak, 1998: 98)

However, this phenomenon has another dimension. As discussed by Bernstein (1971) such language is also a way of achieving 'social closure' or exclusion. As Johnson (1972) goes on to note:

'This phenomena performs the double function of maintaining internal homogeneity and increasing autonomy from outsiders, both competing specialists and laymen, by aiding the process of 'mystification' of outsiders and thereby maintaining the control of the profession over what it considers to be its universe of discourse.' (Johnson, 1972: 56)

This desire by professions to maintain themselves, their freedom and their status by throwing a 'net' around their language has implications for how this behaviour affects knowledge and information. This in turn has implications for the realities perceived and any consequent reinforcement of that status.

A final key factor in public perception of the clinical profession, and the status this accords it, can be found in the 'scientific' approach it adopts to its work. As noted by Higgs (1999) until the sixteenth century medicine was based largely on patients' reports

of their symptoms. Knowledge of anatomy was mainly drawn from Galen's 'On the Conduct of Anatomy'. This second century (AD) text was based on the anatomy of monkeys, not humans. However, as noted by Merton (1942) the Reformation of the sixteenth century allowed for the anatomical dissection of corpses. This enabled comparative studies of anatomy, which allowed for the 'normal' to be distinguished from the 'abnormal' through observation. This in turn enabled a move from bedside medicine towards hospital-based medicine. This was originally characterised by patients being allowed access to care if they would offer themselves for study, thereby providing essential material for scientific investigation of disease. Patients' reports thus became less important than the physical signs their bodies manifested, and both came to be seen merely as indications of underlying pathological factors. Thus the body was elevated in importance by clinicians as a more 'objective' method of investigation than what had gone before. This approach was then supplemented by a range of observation instruments, including X Ray, laboratory medicine, and stethoscopes. All of these apparently further diminished the subjective element of medicine and bolstered perception of its objective, scientific nature.

4.4.6.b People as Professionals, the Clinical Perspective

Looking now specifically at the clinical profession, the origin of the knowledge in question could be argued to start with the birth of the clinician as an individual member of society. For the purposes of this research, with its focus on clinical information, an emphasis was, however, placed primarily on the individual as clinician. More general sociological aspects of knowledge creation were drawn on as appropriate.

Like all professionals, clinicians are trained to perceive within the epistemological and ontological commitments of their respective paradigm of knowledge. As discussed earlier, the paradigm from which individuals operate describes the rules and content that lend authority to a particular discipline. These rules are the epistemology and ontology of a particular field. They form that body of tradition and knowledge that legitimises a particular kind of intellectual pursuit and, importantly, guides which knowledge will be sought and how it will be presented. The paradigm thus defines a

particular way of viewing, negotiating and describing the world. As discussed by Kuhn (1963) and in chapter 3 of this thesis, a paradigm is universally recognised scientific achievements that, for a time, provide model problems and solutions to a community of practitioners. It has an underlying unity in terms of its basic, and often 'taken for granted' assumptions. These separate a group of theorists operating in one paradigm in a very fundamental way from theorists located in another. These assumptions emphasise the commonality of perspective that binds the work of a group of theorists together in such a way that they can usefully be regarded as approaching a social theory within the bounds of the same problematic. Mannheim (1970) also comments on this issue:

'Behind every definite question and answer is implicitly or explicitly to be found a model of how fruitful thinking can be carried on. If one were to trace in detail, in each individual case, the origin and the radius of diffusion of a certain thought-model, one would discover the peculiar affinity it has to the social position of given groups and their manner of interpreting the world generations, status groups, sects, occupational groups, schools etc' (Mannheim, 1970: 118-119)

Mannheim's work did not consider the effects on knowledge processing in an organisational setting, but here once again, what is basically 'paradigm-located' knowledge is being described. This was important in the context of this research for a number of reasons, but mainly because very different 'models' or paradigms were in operation within the field of clinical information.

At the foundation of the clinical paradigm, as noted by Foucault (1973):

'.... the human body defines by natural right the space of origin of distribution of diseases.' (Foucault, 1973:1)

This formed the basis of organisational structures around medicine in the NHS. As discussed earlier, Mintzberg (1983) found that medicine was often characterised by a bureaucratisation of medical care. This 'pigeonholes' medicine in order that external complexity might be converted into uniform organisational categories, within which the clinician's standardised range of skills might be more easily developed and applied. Thus, the body is divided into anatomical sites in which individual clinicians can

specialise and perfect their skills. Coupled with its historical development, there is, therefore, a mechanistic approach to clinical work, providing an appearance of objectivity and certainty, apparently placing medicine and medical knowledge within the realm of science. One might expect hard, objective, reliable 'fact' to result, particularly as:

'.... the natural sciences are generally accepted as true and undistorted bodies of knowledge, their methods as impartial, unbiased models of investigation such has been the enthusiasm for science in western cultures that statements of its truth have taken on the nature of tautologies; science has been allowed to define what we hold to be true about the world.' (Barnes, 1974: 5)

Brown (1992) also comments:

' The gradual but persistent growth in the cultural authority of Western science has led to the achievement of a privileged status at both epistemological and ethical levels.' (Brown, 1992: 71)

Brown (1992) draws on Merton (1942) to discuss this further:

'.... it was accepted that scientists had, by their particular methods, found ways of ensuring that their knowledge was uniquely determined by the state of the physical or social world. This in turn led to assumptions about the characteristics of the scientific community that must necessarily exist if such knowledge was to be realised in practice.' (Brown, 1992: 71)

These findings indicated the possibility that such 'objectivity', rather than being based on a direct line to 'the truth', was socially constructed.

Further exploration of the literature, particularly in the areas of clinical training and practice also supported this and indicated that, far from being a repository of undisputed and indisputable facts, on closer inspection, medicine is a realm of uncertainty (Fox, 1979, De Dombal, 1996).

The work of Szolovits (1994) on linguistics and computer representations in the field of AI was also useful here. His work focuses primarily on the difficulties of reliable linguistic representation of clinical phenomena and work in computer systems, rather

than the causes of linguistic heterogeneity. He does not go on to consider the implications of this for knowledge and information outside the clinical sphere. However, as a product of this work, he asserts that:

‘Uncertainty is the central critical fact about medical reasoning. Patients cannot describe exactly what has happened to them or how they feel, doctors and nurses cannot tell exactly what they observe, laboratories report results only with some degree of error’ (Szolovits, 1994: 1)

As noted by Fox (1979) and De Dombal (1996) medical teaching reflects this. It is based on a recognition that an irreducible amount of uncertainty is inherent in medicine. Fox (1979) asserts that three basic types of uncertainty may be recognised. The first results from incomplete or imperfect command of knowledge available about the discipline of medicine. The second stems from limitations in current knowledge. The third can derive from the first two, and rests upon the difficulty in distinguishing between personal ignorance or incompetence and the limitations of present knowledge. Literature in this area makes clear that it is assumed that medical knowledge gained thus far must be regarded as tentative and subject to constant further enquiry, and that few absolutes exist. It reveals medicine as something less than an exact science. Indeed, it reveals it as being as much an art as a science, a matter of judgment as well as skill. Notably, judgment, in the same way as art, is about subjectivity and interpretation, not empiricism.

The question this raised was how clinical work could be conducted on this basis. This was not to say such knowledge was considered unreliable for current practical purposes, if such knowledge was viewed as ‘justified’ in the sense described by Rorty (1979, 1982). Rorty puts forward the notion that whatever knowledge is, it need not and cannot be justified in terms of accurate reflection of the real world. It might, however, be justified by achieving the status of ‘disciplinary objectivity’, or the pragmatic consensus of individuals in a specific paradigmatic community, which gives certain knowledge the status of ‘fact’. Thus ‘objectivity’ loses its association with some immutable ‘truth’ and becomes knowledge arrived at by a process that consciously attempts to reduce subjectivity. In this way it increases levels of confidence that can be vested in it. This allowed ‘truth’ to become a changeable

artifact, which is a notion that arguably finds some support in the significant shifts in knowledge which history can demonstrate. For instance, we no longer believe the world to be flat. It also, however, raised issues about the definition of 'truth' in use in Rorty's argument, i.e. whether truth is what really exists, whether or not we have sufficiently extended and structured our understanding to recognise it, or whether truth is the accepted knowledge on which society acts. It also begged the question of whether such knowledge, when transferred into a computer system or outside the realm of the clinical paradigm, remained characterised by uncertainty.

Looking at such a philosophical base in practice, the literature indicated that a wide range of factors could then affect this basic uncertainty, extending the heterogeneity of clinical knowledge. Levels of acquired competence and skill affect uncertainty, as do levels of 'experience' generally. Experienced clinicians tend to elicit less information than their more junior colleagues, but they also tend to elicit more relevant information. They are also able to combine these items of information more appropriately than their juniors. Clinical experience generally operates as a weighting function that gives preference to these more effective types of connections. As discussed by Kluge (1996) responding to an article about the medical record:

'.... these weighting functions are integral to the conceptual framework of the clinician as the clinician gains experience.' (Kluge, 1996: 88)

They are also influential in determining the reality perceived and represented.

The practical consequences of this conceptual framework are further enlarged upon by De Dombal (1996) particularly if uncertainty is taken to mean not holding objective characteristics, i.e. not being hard, immutable 'fact'. In discussing the need to abandon simplistic models of clinical perception and information (which he describes as historically descriptive or determinist and more latterly probabilist) when designing computerised clinical information systems, De Dombal comments on factors affecting the objective value of a piece of clinical information. He presents an equation composed of a number of elements, which he asserts are not, so far, taken account of in either current determinist theory, current probabilist teaching or decision support

systems. The equation includes the evidential value observed in previous surveys, the degree to which the local circumstances reflect the findings in various surveys, the confidence with which the clinical feature was elicited, the overall reproducibility of the process of elicitation of that feature, the clinical acumen of the individual eliciting the information, the relevance of the information to the role of the individual in the overall healthcare delivery system, and the timeliness of the information to the situation. De Dombal presents these factors as a list, indicating that, whilst he believes they influence the objective value of a piece of information, there is at present no knowledge of how they influence the value or how to combine them. What De Dombal is saying is that the Medical Informatics community has largely accepted, or believes in, simplistic representations of knowledge, 'such as clinicians' expressed opinions' (De Dombal, 1996:1) but reality is much more complex than this. This is particularly so if, as he also notes, the elements in the above-mentioned equation reverberate through all subsequent decisions taken in the field of healthcare. These include allocating resources, as well as those direct clinical decisions pertaining to individual patients.

The literature also offered insights into the process of applying and acquiring clinical knowledge and information in a live setting. The review revealed a great deal of work aimed at creating computerised clinical information systems. There was, however, little that focused in any great depth on the relationship between the knowledge to be contained in those systems or the uses of that knowledge, particularly outside its sphere of origin.

Looking at clinical knowledge in more detail, the epistemological steps leading to a clinical diagnosis are described in Kluge's (1996) work discussed above. They are quoted here as a reference against which to begin review of this process in live settings. Kluge notes:

'.... the initial job of the clinician is to identify the data, dissociate them as much as possible from the connections that the patient has made and then note the data The physician then supplements these data by the data he or she gathers in an investigative fashion, either through direct observation or investigative procedures. The totality of the data thus generated constitute the basic patient

record The body of knowledge that characterises the specialty (if any) of the clinician - which is to say the clinician's conceptual framework - then functions like a filter by attaching various weights to different lines of possible connection among the data The result is a patient profile. It may leave certain possibilities of connections as mere possibilities. On the other hand, if only a single set of connections remains, the result is a diagnosis.' (Kluge, 1996: 91)

In addition, Kluge notes that different specialties can look at the same data and come to different conclusions. Here Kluge gives some indication of the variability of the processes of perception and observation and, consequently, offers further insight into the heterogeneous nature of the data that may emerge. Although many of the studies reviewed considered this from the perspective of the certainty of clinical knowledge, again, none of them addressed the issue of clinicians looking at the same thing and labelling their observations differently. The issues of further heterogenising clinical data and the effects on ensuing information were not, therefore, explored.

Kluge is quoted at length here. This is because he gives a useful model of the process of clinical profiling and perception leading to knowledge and information generation, and deepens insights into the nature of that knowledge and information. This was considered to be important because this did not stop a programme of mass standardisation of this data, nor did it stop its use for purposes requiring 'objective facts' as their basis.

Moving now to the construction of a record of this knowledge, as detailed above, Kluge describes a patient record as 'the totality of the data ...' (Kluge, 1996: 91) generated by the clinician and patient encounter. The researcher's experience suggested this was rarely the case and the medical casenote was often a working log for the clinician. In other words it was unique to each author and situation, and so contained varying degrees and types of information, as deemed necessary by each clinician for each patient when they were treating them. Kay and Purves (1996) in describing their work on the record, offer further insights:

'.... from the start there are two markedly distinct, often diametrically opposed viewpoints of the same event that have to be distilled into the medical record

the viewpoints may or may not be reconciled and both may not actually be recorded' (Kay and Purves, 1996: 78)

They go on to note:

'.... in general the clinician will construct the record from a mixture of measurement (quantitative and objective) and observation (qualitative and subjective). The former will involve scientific discourse, the latter ordinary discourse.' (Kay and Purves, 1996: 80)

It seemed, therefore, that in the record there was a mixture of 'objective fact', or at least fact about which there was social consensus, e.g. 'the baby's temperature is 101.8 degrees', 'the child was administered pertussis immunisation', and subjective opinion or observation, subjectively labelled, e.g. 'the child has scarlet fever'. The literature failed to yield evidence that the relative prevalence of either type was known.

These differences became important when consideration was given to how such inherently heterogeneous data was firstly homogenised and secondly, during that transformation process, globally endowed with the status of objective fact. As discussed, the instruments for collecting and representing such phenomena were statistical clinical classifications. These were apparently perceived by their protagonists as adequate for capturing clinical reality to such an extent that the conditions and treatments of every patient coming into contact with the NHS could be reflected by them. In other words, the possibility of two different versions of the same reality can be perceived here.

As noted by De Dombal (1996) and discussed by Kluge (1996) the kinds of description provided by Kay and Purves (1996) are:

'.... based on the phenomenological insight that the perception of data is conditioned by the conceptual framework of the perceiver, that the perspective, the nature and structure of this framework colours what is seen.' (Kluge, 1996: 88)

This is consistent with the kind of philosophical notions that assert that there are no objective facts in the world, that so-called 'facts' are 'facts as perceived', and that they come laden with characteristics that are contributed to by the observer's conceptual

framework. If this is so, the interaction between clinician and patient is not a scientific or interpretationally neutral fact gathering exercise, because it involves something other than a neutral information transfer, if such a thing exists. The entire process carries its own phenomenological burden:

‘The physician when recording data received in the physician/patient encounter records not pure data but data-as-information’ (Kluge 1996: 88)

In other words the clinician enters data with meaning, or ‘information’. He enters only that data he perceives as relevant, relevance being a product of his conceptual framework. That framework appears only to extend to the direct care of the patient by the clinician.

This also affects how this data is presented in relation to other data and how it is arranged. To this must be added consideration of that fact that the record is often a multi-author text. Patients often see more than one doctor in a lifetime, and even in the course of one series of hospital contacts.

Cognitive psychology supports this phenomenological view. As discussed earlier, as a result of several studies, including those of psychologists Bruner et al (1947) and Postman et al (1948) it maintains that it is becoming increasingly clear that ‘believing is not seeing’. People see what they wish to see and perception is guided by inner cognitive sets that reflect past learning experiences, values, motives, basic personality needs and self-confidence about ability to act effectively in a given situation. Thus it is not surprising that cognitive psychology notes that words of a high value to a perceiver are seldom rejected in the face of meager information. These insights were of importance in exploring the behaviour of non-clinical users of the clinical record, in terms of transcription of medical records.

The issue of ‘relevance’ already, therefore, began to emerge as complex and important. As discussed earlier in this thesis, all knowledge claims exist in the form we know:

‘.... as a response to particular interests in prediction and control, which are in turn related to social interests.’ (Barnes, 1977: 30)

For instance, the dominant interest influencing 'relevance' for the clinician in recording information in the medical record could be purely anything that enabled their continuing care of the patient. It could alternatively, however, be that which might be relevant to the clinician's defense of clinical decisions at some later date. For instance, it was possible that the clinician knowingly omitted data that may be seen later to challenge those decisions. Anecdotal evidence suggested that this happened all the time. Alternatively, 'relevance' in this context may have been related to the medical record being an action log:

'.... a document oriented towards action, and the as-yet unwritten future of the patient story.' (Gremy et al, 1996: 95)

Whatever the underlying perceptions of relevance that determine the content of the record, the researcher's experience prior to this study indicated that use by non-clinicians was never a consideration made by clinicians when writing it. The importance of this issue rested, not least, in the perception of this document by non-clinicians about its purpose and the nature of its contents. These users included many who believed the medical record to be:

'.... a scientific, technical and cold document.....the data written (on it having) every quality of scientific data' (Gremy et al, 1996: 95)

The work of Gremy et al does not comment on whether it does have such qualities, or whether it is assumed to have. However, if Kluge (1996) De Dombal (1996) and Kay and Purves (1996) are correct, while such a document may have, or even need, the appearance of scientific data, whether it is possible for this to be the case must be challenged. The evidence above suggested not. Also, if this document did have such an appearance, as mentioned above, exploration of why this was so was merited. It may simply have been, as earlier evidence suggests, that non-clinical users were allowed, or required, to project their assumptions about medicine onto the document. This may have been happening partly because they were using that data in isolation from its clinical author(s). However, it was also the case that medicine emerged from this review as a self-regulating community that, in a united way, faced the issue of uncertainty. Clinicians are trained to develop an affirmative attitude towards doubting

and can admit they are unsure because, as described above, their training teaches them that a level of uncertainty is inevitable. In addition, however, they must act as 'savants' if they are to meet their clinical responsibilities. They cannot doubt as openly as they feel. They must commit themselves to some of the tentative judgments that they make. As noted by Szolovits (1994):

'.... we must make important decisions about testing and treatments and, despite our uncertainties about the bases of those decisions, the decisions themselves must be definitive.' (Szolovits, 1994: 1)

In addition, the work of Dreyfus et al (1986) on the progress of AI indicates that acting as savants leads ultimately to failures even to recognise the intuitive factors in their decision-making. The very nature of their skill, the fact that it constantly requires them to play God, seems to predispose *them* to think of their decisions as being rule-based. Doctors apparently attempt to rationalise their intuitive decisions to explain them to their patients and to justify them to themselves. It was, therefore, of interest to this research to explore whether and how the imperative of definitive decisions, and the resulting beliefs clinicians held about their own behaviour, had worked backwards along the information chain and encouraged large-scale reification of heterogeneous, judgmental observations into objective fact.

4.4.6.c People as Clinical Professionals, An Initial Summary

Medicine is socially perceived to lie within the realm of the empirical sciences. Its knowledge base assumes, therefore, all of the associated characteristics, i.e. objectivity, certainty, explicitness and, importantly, 'truth'. Knowledge from this sphere defines for society outside medicine what we take to be true about that world.

This view is at odds with what the literature revealed. It indicated that there are some tried and true 'hard facts' about which there is little argument, but also there is a provisional nature to much that is assumed to be medically known. Medical teaching reflects this. It is based on the recognition that an irreducible amount of uncertainty is inherent in medicine. In addition, clinical perception, knowledge and information

emerged as characterised, to some unknown degree, by an unavoidable phenomenological bias. It is highly judgmental, subjective and heterogeneous. Data sources coming from this realm, e.g. clinical records, emerged as documents whose purpose and content were possibly ill-defined, possibly misunderstood, and whose contents carried with them all of the heterogeneity inherent in their origins and purposes. These were the main source of all Governmental clinical information about NHS clinical encounters. However, because knowledge from this domain was taken to be 'true', truthlike characteristics were attached to the data they contained.

The power exerted by the scientific nature of this domain, and knowledge, data and information coming from it, were shown to be further reinforced by the professional status of clinicians. This included social arrangements that were such that outsider ability to know or challenge the 'realities' constructed by professionals is limited. This power was also shown to be buttressed by a highly developed community language, which maintains internal homogeneity and increases autonomy from outsiders.

All of this was considered to have two effects that were key in terms of this research. Firstly, all clinical data did not appear to fit well with the requirements of the statistical systems that were routinely using it. The relationship between the two appeared tenuous at best. Decisions based upon such data were, therefore, suspect. Secondly, it appeared that clinicians themselves played a part in perpetuating this situation. It was necessary, therefore, to explore the part played by individuals in creating and recreating the reality in which they existed and the implications therein for knowledge and action. If, as Kluge (1996) Bruner et al (1947) and Postman et al (1948) assert, the framework of the perceiver colours what is seen, the effects of structured information systems could not be underestimated. These systems were presenting versions of clinical data that were contextually impoverished and allowed, and even necessitated, imposition on them of users' contexts.

Given the insights gained by exploring the clinical profession, the paradigmatical commitments of other key organisational player were explored next.

4.4.7 Ministers and Managers, A Discussion

Looking first at Ministers, the Government of the day appoints Ministers from among its Members of Parliament. While these Ministers become servants of the Crown, their first loyalty is ostensibly to a particular political ideology. This ideology must be both actively and demonstrably supported, and successful. On that basis political images, ambitions and careers are developed and promoted. As demonstrated in the discussion of NHS statisticians in chapter 8, the role of the Civil Service is to support Government policy, regardless of political hue.

Also, Government is funded by public money. The result of this is that Government has a key responsibility to demonstrate accountability in terms of how the money is spent and whether or not the public is getting the best for that money. This accountability is usually in relation to large and complex areas of public spending like transport, education and, the subject of this research, healthcare. It also encompasses decisions that affect hundreds of people and events, and are usually made with a minimum of informed judgement, local knowledge or subject expertise. Porter (1995) in considering the historical development of statistics, offers relevant insights here:

‘In a republic, where anyone can be anything, the most ignorant may be assigned the most difficult functions.’ (Porter, 1995: 84)

This means that Ministers are in a poor position to challenge the integrity of public statistics that are presented to them and yet must rely on them. Quantification is shown, therefore, to be not only a technology of the inexpert, but also ‘.... a technology of distance.’ (Porter, 1995: ix).

Their position as public servants also means that Ministers need the appearance of impartiality in their professional behaviour. Their own judgement must not appear to be active or criticisms of bias and personal interest may result. Statistics again play an important role here. As discussed earlier, quantification is the technology of objectivity.

In turning now to look at managers, work by Handy (1985) provided what were considered to be the most useful insights. One of the ways in which he categorises management is as a 'semi-profession' (Handy, 1985: 381). However, on the basis of what he describes as 'many years of dealing with managers and of being a manager' (1985: 386) he also asserts that this semi-professional status is warranted because management does not yet manifest the key aspects of professions as described above. These include a recognised body of knowledge and enforced standards of practice. It is, however, a recognised occupational role in society. It is debatable whether this constitutes sufficient grounds for the application of the title 'semi-professional'. What was important to this research, however, was that it was deemed at this stage that influences on the research problem caused by professional status were unlikely in the realm of the manager. Handy (1985) also asserts that:

'It has never been easy to define what a manager is or what he does. It is a useful concept, 'management', the missing 'x' which makes resources equal output. But the 'x', the exact qualities tend to shift from equation to equation. Definitions of the manager, or the manager's role, tend therefore to be so broad they are meaningless'(Handy, 1985: 361)

Exploration of the manager in the context of the research domain was, therefore, undertaken within the field research stage.

4.4.7.a Ministers and Managers, An Initial Summary

The primary responsibilities of Ministers are to uphold Government policy and achieve public accountability in a way that indicates not only financial probity but also policy success. Ministerial decisions are made on the basis of a number of factors, one of which includes public statistics produced by Government departments. There are a number of reasons for this. Firstly, decisions often relate to huge areas of the population. Secondly, practical issues mean that they are usually made with a minimum of informed judgement, local knowledge or subject expertise. Thirdly, the position of Ministers as public servants requires an appearance of impartiality in their professional behaviour, which decisions based on statistics can provide. Ministers have, therefore, a significant vested interest in perpetuating the collection and use of

Government statistics. Ministers' ability to challenge the integrity of data in the form of public statistics is limited. However, the extent to which this is problematic for them is possibly tempered by the scientific status that attaches to them. It may also be affected by the fact that use of these systems creates a micro-reality beyond which nothing is seen to exist and which is difficult to challenge. This raised questions for the research about the practical usefulness of such an exercise, in terms of healthcare, if that micro-reality was shown to be fictional.

4.5 The Literature Review: A Summary of Key Issues and Some Initial Hypotheses

This section begins with a review of the original research questions and key findings from the literature review. It then draws on the key points from the above discussions, and develops these into tentative hypotheses relating to the original aims of the research.

4.5.1 The Aims of the Research Revisited and Addressed

As discussed in Chapter 1, the specific research questions were as follows:

- Is there an objectivity inherent in clinical data?
- What is the relationship between the social knowledge processes involved in clinical decision-making and the nature of data produced from those actions?
- Can it be so readily translated into the body of statistical fact that underpins the data sets for healthcare decision-making?
- What is the impact on decision-making in healthcare management?

Evidence from the literature review indicated that some clinical data fits the socially accepted view of objectivity. This is data about which there are high levels of consensus and certainty, e.g. temperature readings. Human influences were recognised in these areas but they were seen as less active. Evidence was also found of data that did not fit into this view. Uncertainty emerged as a central tenet of clinical work.

Clinical knowledge was shown not to be a homogeneous body of scientific fact, most significantly by medical teaching itself. Rather it emerged as a mixture of fact, tentative judgement and opinion, wherein individual elements could change their status. This was shown to be particularly so where that status was influenced significantly by changeable factors like professional experience, confidence and additional knowledge. This finding indicated that, given current processes, it could not be so readily translated into the body of statistical fact underpinning healthcare decision-making.

The reasons for this were explored in the second research question, which concerned the social knowledge processes which link clinical decisions and related data. Social factors were shown to be highly influential. They included the nature of the systems and processes used, and the nature of the two key stakeholder groups.

Looking first at the key groups, their views of clinical reality were shown to be quite at odds with each other. Findings showed that societal perceptions of, and arrangements for, science (and medicine is included there) endow its scientific works with a status of fact. Thus, the knowledge base of medicine was shown to be externally characterised as being objective, certain and factual. Also, societal perceptions of, and arrangements for, the professions were shown to enable the kind of autonomy that precludes outsider ability to know or challenge the 'realities' constructed by professionals. This was seen as both enabling and requiring clinicians to perpetuate a global scientific certainty about their domain. It was also shown to allow them an insulated freedom in their use of data and information. The needs of the wider organisation did not concern them.

Organisationally, this group operated alongside the other key stakeholder, the managers. Societal arrangements here were shown to revolve around the need for public accountability and authority, and certainty and objectivity in decision-making. This required managers to extract data from the clinical workplace. Displaying all of the characteristics of their belief about clinical work, managers employed a series of processes in handling clinical data which delivered what they needed, i.e. objective facts. If one takes psychological observations, which indicate that cognition is a product of each individual's frame of reference, and puts them together with

decontextualised data, an arguable observation is that user assumptions about computer data, and their own paradigmatic or role motivations, imposed a scientific context and range of characteristics on clinical data in coded systems, thereby enabling the model to become the predominant reality. The models of reality upon which these systems were operating were shown to reflect the positivist view, and the data yield did nothing to challenge that.

The systems provided, therefore, a uniformity and certainty that did not previously exist. The nature of these structured systems was shown to subsume distinct clinical entities within clinically-based but aggregate labelling schemas, and also to decontextualise it. As discussed, information can only become information in a context (Checkland and Holwell, 1998). The importance of this is that quantitative methods are necessarily and unashamedly reductive and strip context out. Also, coding has been shown to add permanence to data. This made tentative opinions appear definitive. In other words a transformation of meaning took place. Clinical knowledge was invalidly transformed into a homogeneous body of statistical fact, and social knowledge about the reality of clinical phenomena was impaired. Key social knowledge processes were found to include enactment of social context by individuals and groups. This process was shown to underpin the choices made in terms of processes applied to clinical knowledge and data. Thus they were shown to be consistent with use in this context of computers and coded statistical classifications and processes.

In terms of the last research question, the implications of these findings for decision-making in healthcare management, were significant. Firstly, there were implications for all of the areas listed in chapter 1 as ways in which this data was being used. In addition, there was increasing pressure to extend the use of coded, computerised systems in healthcare data processing. Electronic health and patient records would take this beyond administrative use and into the sphere of direct patient care. These simplified models of complex realities provided, therefore, an increasingly inadequate basis for understanding and supporting real behaviour.

The next stage in this research was to test these tentative theories against the reality of the problem domain. First, however, consideration was given to the methods considered, rejected and selected for undertaking this phase of the research.

Chapter 5, Approaches to Field Research, A Methodological Discussion

5.1 Introduction

The purpose of this chapter is to provide a methodological discussion. It builds on some of the philosophical discussion and hypotheses established in chapters 3 and 4 and discusses the methodological issues addressed in approaching the fieldwork stage of data collection. It first describes the methodological approach chosen. It then provides an argument in favour of this choice by discussing the major alternatives of deductive and inductive methods, and providing a critique of each. The selected approach followed the inductive tradition, on the basis of earlier findings relating to the apparently social foundation to the research problem. The justification of that choice included consideration of how the selected approach avoided the difficulties perceived in the alternatives, which were rejected.

The chapter then describes the specific data collection methods adopted, which were semi-structured interviews and observation. This part of the discussion also includes consideration of the role of the researcher in undertaking these processes. The chapter continues with a description of the research design and application of the methodology, which includes discussion of prospective interviewees and interview sites. These included senior clinicians, healthcare data statisticians, administrative workers involved with healthcare data, healthcare managers, and lastly a number of hospital sites chosen for observation purposes. The chapter then moves to a discussion of issues involved in gaining access to these people and places. The closing section provides a brief overview of the process of interviewing, including how questions were chosen, and how interviews were organised.

5.2 Methodological Approach Chosen

This research has three main methodological features. These are consistent with the research aims and with the problem as perceived. First, it is empirical and field-based. Research-based studies of the problem and aims, as defined in this thesis, were not found. A significant gap in our understanding in this area was, therefore, perceived. Accounts in this thesis are based on observation in the field, which are explored through relevant literature.

Second, the methodology is based on discovery rather than demonstration. The purpose was to formulate and generate hypotheses in an area previously unexplored in this way, rather than to prove or disprove preconceived explanatory theory.

Thirdly, the approach sought to encompass and enable analysis of a wide scope in terms of organisational context. This gave equal weight to the importance of context and the social interactions within it. This recognised the possibility that the mutually constitutive nature of context and actions would yield explanatory insights.

This overall approach, of complex, discovery-based research yielding rich, qualitative data, was aimed at producing a deep understanding of the processes and contexts involved in the domain of clinical decision-making. It suggested a strategy of qualitative research, carried out using a range of qualitative techniques, as described by a number of authors (Hakim, 1987; Walker, 1985; Burgess, 1984).

5.3 Argument for the Methodological Approach

In making these choices the researcher was conscious of the aims of the research. Also, no single method was held to contain the key to 'truth'. All observations, from whichever end of the methodological spectrum they came, were considered as having an

interpretive, subjective dimension. This assertion was based on the notion that all research methodologies intentionally adopt a specific epistemology. They all intentionally adopt a specific perception about the nature of problems and problem situations. In other words, they are ontologically intentional. Either their underlying worldview accepts the current problem situation as 'real' or it assumes it is simply an interpretive construct. All methodological truths are, therefore, partial, since all methodologies are selective. If a researcher deliberately selects, and therefore excludes, the thing that is being indulged in must be partial. As well as being partial, all such truths are 'valid', or have power, but only with respect to their associated worldview. Thus, the notion of 'absolute' truth is not active here, but rather contextual truth, in other words truth in the context of the worldview that is associated with it. Consequently all such truths are provisional. In addition, all such truths are non-refutable, but are replaceable. They are non-refutable because, as has already been said, they are true only in the context of a particular worldview. Therefore, it is possible to reject a methodology by asserting disbelief in its claims to analyse. However, a more useful approach might be to examine what a particular methodology means by analysis, what its worldview is. This may reveal that it measures up to its own standards. The claim of the methodology, in that case, cannot be refuted. The researcher can only replace it with a preferred method of analysis that reflects their own worldview. The usefulness of a methodology is, therefore, situationally dependent. Any methodology can be used in a situation as long as the intentional perceptions that govern the methodology are consistent with the intentional perceptions that have been chosen for exploration in the problem situation. This ensures a match.

Selection of a methodological approach began, therefore, with conscious exploration of what of what was meant by the term 'methodology'. This resulted in a definition which described a methodology as a model for enquiry and action composed of an organised set of structured, inter-related rules and procedures, based upon, and reflecting, a particular set of philosophical commitments and their ensuing paradigm. It is applicable in research and is intended to produce a better development process and end product by

investigating and obtaining knowledge by means of formalised procedures. This indicates the fundamental importance to any methodology of the philosophical beliefs upon which it is based. The implications of ontological realism and epistemological positivism, and ontological nominalism and epistemological interpretivism were, therefore, explored.

As discussed in chapter 3, the ontological position of realism adopts an objective stance and revolves around the assumption that reality, both social and natural, is external to individuals and independent of their cognition of it. It is composed of hard, tangible and immutable structures that exist as empirical entities, whether or not we label or recognise them. Consistent with this, epistemological positivism postulates that, if reality is hard and independent, knowledge gained from it is hard and capable of being transferred and acquired by different people, in the same or comparable ways, with the same end result. The act of acquiring knowledge is repeatable and the knowledge gained is testable against the immutable reality. Explanation of reality is possible through the identification of causal relationships.

The nominalist position, however, adopts a subjective stance and postulates that 'reality' is inextricably linked with the individual because it is a purely subjective construct and has no independent existence or uniquely identifiable structure. Each individual will, therefore, have a different 'reality', because it has arisen from perceptions unique to them. Epistemological interpretivism follows from this view of reality and, therefore, considers knowledge to be non-transferrable, interpretively descriptive and something that, in order to be gained, must be personally experienced.

Mapping these philosophical commitments onto the various paradigms they have given rise to, scientific methods are reductionist; if reality is an immutable phenomenon then areas may be fragmented without loss of emergent properties. They are also repeatable; the quality of immutability renders investigation and experiment repeatable and the results of such work may, therefore, be refuted or corroborated. If, however, the

interpretive paradigm is explored, methods here seek to be interpretively descriptive of reality, and the nature of evidence is deemed to be non-repeatable.

Methodologies formulated within either of these belief sets will reflect them in almost every way, from their choice of scope and objectives, to their techniques and tools. They can, therefore, be described as operational manifestations of particular ontological and epistemological beliefs, and as characteristic of a particular paradigm. Informed choices must, therefore, be made.

In doing so, a number of heuristic devices are available. One such framework is taken from Gill and Johnson (1997: 37). It represents a continuum of research methods that describes the conceptual differences between them and thereby describes the differences they bring to bear on a research situation. At a macro level, the organising principle of the framework is that of nomothetic and ideographic methods. Gill and Johnson provide an analytical table displaying the relative key differences between these extremes, which are summarised here, but which predictably shows great similarity to elements in the tables of paradigmatic parameters in chapter 3.

Nomothetic techniques and methods are most reflective of the scientific paradigm. They represent application to the social world of scientific method, which found success in relation to exploration of the natural world, e.g. in areas such as physics. Nomothetic methods are, therefore, highly structured and systematic, in order to ensure replicability of method. They seek to generate explanation on the basis of causal relationships that give proof to governing laws. They rely on quantitative data in this, processed via standardised control techniques, in order that hypotheses might be tested in accordance with the standards of scientific rigour. These methods are also deductive and involve first abstract development of:

‘... a grand theoretical schema as an absolute precondition for carrying out research.’ (Bryman, 1988: 111)

They involve testing of a pre-existing theoretical model or set of principles by confrontation with reality in the external, objectivist sense.

To expand, in deductive research the researcher first decides which concepts represent important aspects of the problem domain or theory at issue. In this way a conceptual boundary is drawn around certain phenomena whose totality is deemed by the researcher to be of interest. Concepts in this scenario are abstract phenomena linked by what are assumed to be causal relationships that are deemed possible or probable, but are in no way certain. In other words, initial theories that assert explanation of the relationship between cause and effect in a problem domain follow from theoretical considerations. They are, however, a priori to the extent that they have not been tested against real life situations. Testing in this sense requires that such abstract thinking is 'operationalised' (Gill and Johnson, 1997: 29).

Operationalisation requires a number of things. Firstly it requires development of precise models and precise hypotheses for testing. Thus it requires tight definition of what is to be observed, i.e. development of definitions of concepts and other rules in order that it can be agreed and determined when an instance of a concept occurs and how it might be observed occurring. The example of this provided by Gill and Johnson is that of middle management. This can mean very different things to different people, and the sense in which it relates to the research problem must, therefore, be tightly defined in order that data collection can be standardised and the meanings of research output are clear. Operationalisation also requires formulation of, and adherence to, instructions developed on the basis of definitions and rules. In other words, it requires the kind of standardisation of approach to be expected, given the underpinning ontological and epistemological perceptions at work.

This entire process enables the next stage, which is testing of theories against collected data. If a match occurs the theory is taken to be a valid explanation of observed

phenomena. However, the process also ensures that much, or all, contextual information is stripped away.

Turning now to ideographic methodologies, these are reflective of the interpretive paradigm. Again, as might be expected, they seek to generate insights and knowledge precisely on the basis of what nomothetic methodologies reject. Thus ideographic methodologies seek subjective accounts and meanings. Qualitative data gathered within this context is deemed key to generating required understanding (Bulmer, 1977, Cicourel, 1964). Replicability is not sought and systematic protocols are, therefore, minimal. These methods are inductive, with theory emerging from inductive investigation. As noted by Thompson (1995) this relies heavily on the willingness of the user to abandon, temporarily at least, any preconceived notions about likely outcomes of investigations and to adopt an open-mindedness about results and methods.

Turning now to the problem domain as perceived, this was deemed to involve technology, structures, tasks and processes. These could be perceived as relatively passive phenomena. However, and this was particularly relevant to the field research stage, the situation was also thought potentially to involve people as key agents in the problem as perceived. This selective perception of the problem domain had, therefore, a significant social dimension. In terms of a match between methodological approaches and this selective perception of the problem situation, the work of Laing (1967) was useful. Laing focuses on the fact that nomothetic method extends to the social world scientific approaches that have been successful in relation to exploring the natural world. The crucial distinction Laing emphasises is that individuals, unlike objects, are sentient creatures, which experience reality. He stresses that human action is bound up with individual mental constructs, composed of a whole range and diversity of psychologically- based phenomena rooted in an internal logic and subjective awareness.

Given that situation, application of nomothetic method was considered undesirable. It would require imposition of standardised structures and protocols in order to reveal

causal relationships subject to governing laws, as in the natural sciences. It would also require excision of contextual meaning. This, the positivist approach would argue, would provide shared, useful knowledge that is open to examination, proof and refute. It would also enable predictive theory. However, as stated, the problem domain as perceived included the highly subjective and diverse nature of the human subject. Understanding in this contextual, social sense could not be gained via a method of analysis that excised meaning and context as irrelevant. In such circumstances behaviour could only be comprehensively explained via an interpretive approach which involved understanding meanings, motives and interpretations. This would enable the researcher to access these phenomena and achieve a more rounded account. Thus abstract theories could not be constructed outside the context of involved actors, rather they had to take account of and be drawn from them. This double hermeneutic would enable the researcher to see the problem domain through the experiences and understanding of those involved and, by reinterpreting those accounts, develop explanatory theory.

Gill and Johnson (1997) concur that social phenomena are seen to be most accessible to such inductive methods for two reasons. They argue that firstly, explanations of those phenomena that are closer to the truth are more likely because data collection and theory building are integrally linked. Secondly, where the phenomena in question have subjective capabilities (i.e. human actors) imposition of an a priori frame of reference is seen as inappropriate.

Thus, as stated above, within this research no a priori assumptions could reliably be made with regard to how, and even less so why, different 'societies' viewed and understood the same phenomena differently. That understanding was part of the purpose of the research. As discussed in the report on the literature review, it may have been that social labels were subject to differing uses by different social groupings and to different degrees of social uncertainty within that. As asserted by Schatzki (1983) and discussed in chapter 3, the factors that determine meaning are the factors that determine

understanding and the meanings of phenomena and one's understanding of them are, therefore, complementary. Thus, by being socialised we come to understand the roles items play in our activities and consequently an item plays no role that is not understood by someone. 'Socialisation' in the context of this research was not used in its generic, macro-level form. Rather it was used in the sense of 'nested socialisations' of individuals, through their socio-historical general backgrounds and via vastly different professional spheres, each carrying their own worldviews, values and interests. Thus a return can be made to Rorty's observation (1979, 1982) that 'justified' knowledge arises from the pragmatic consensus *of people in a specific community*. For instance, research thus far indicated that clinical observations tended to be grounded in uncertainty, and that labelling was often tentative. However, the same data seemed to be viewed in the culturally very different world of statisticians as hard, objective fact, its labels as sound and precisely descriptive of their real-life phenomena. As discussed earlier, in this context, and this is a view which seems to have support in the work of Barnes (1974) 'truth' seemed to be a changeable artifact and knowledge reflected that which was held to be true *by a given community at a given time*. Thus, an objective of this research was to follow that consensual 'truth', and to understand, more fully both those cultures within which it existed and the metamorphoses it underwent as it was viewed through differing social lenses.

This required the researcher to immerse herself in the problem situation, and engage in:

'.... participating, covertly or (as in this case) overtly in people's daily lives for a period of time, watching what happens, listening to what is said, asking questions - in fact, collecting whatever data are available to throw light on the issues that are the focus of the research'. (Hammersley and Atkinson, 1983: 1)

Data collection was undertaken, therefore partly by using ethnographic methods. Nascent theories were tested and developed on the basis of what Kolb et al's (1979) experiential learning cycle describes as actual experiences, observations and reflections. This follows the inductive tradition of analyses, where explanations of human action are generated inductively from a posteriori understanding of the interpretations displayed

(i.e. the cultures) by the actors who are being studied. These theories included those generated as a result of prior experience of the NHS, which resulted in a belief that there existed a problem worthy of investigation. They helped to define the problem situation in terms of a systemic boundary, and gave some notion at least of involved agents. Theories also included those generated by the literature review, which can be described as attempts at explanatory statements about the problem situation. These theories were developed, refined and tested, ultimately, against reality in the problem domain.

That the situation was approached with even tentative theories seems inconsistent with an inductive description. However, the approach used was to hold these tentative explanatory notions in suspension and to adopt an inductively open-minded approach as far as possible in that domain, returning to the hypotheses as relevant, but not imposing them in any formative way on it. In addition, no explicit definitions of concepts were formulated beyond those generally held socially. Nor were data collection techniques rigorously structured.

As discussed by Kolb et al (1979) this approach is relevant where there is a requirement for observation and reflection upon experience of social phenomena in order to formulate an abstract rule or guiding principle, which can then be extrapolated to explain and predict new or similar experience. It also overcomes the criticism that it provides only a posteriori 'thick description' (Geertz, 1973, Denzin, 1978) of actors' interpretive schemes, by its approach to analysis and focus on analytically induced theory grounded in the real world interviews and observations of the research and observation (Glaser and Strauss, 1973). This enabled identification of significant relationships in the data and generated more insightful explanations as a result

The process of research was, therefore, as follows and in three phases. These overlapped to some extent, but in broad terms can be described as a logical sequence. The first stage involved the systematic collection of accounts and other data through a process of field research. In this stage the research instruments being applied went

through an iterative process of design, testing through piloting, and full application. These instruments included approach to consultancy activities, for instance methods of gaining access, and interview and observation schedules and structures. That this data was collected at a more tentative stage of the research was taken account of in later stages by collection of additional data. This early data was not discarded however, as first impressions were treated as having value.

Following this process of immersion and engagement in the problem situation, the data was analysed. This process produced the conceptual framework within which explanatory theory emerged. This rested upon relationships between key concepts derived from the data. This addressed the aim of developing explanatory theory that was grounded in the real world interviews and observations (Glaser and Strauss, 1973). This gave the analysis an element of independence from the literature review. Glaser and Strauss recognise the usefulness of existing literature in providing conceptual categories for field research. However, they caution against a review before the fieldwork, asserting that the researcher runs the risk of disabling their ability as a theorist. They warn against the danger of getting stuck with an exclusive view on the data collected, and not allowing macro theory to enrich views on micro phenomena. It was, however, felt that it is possible to access existing literature without becoming trapped in the view that it represents the final and total truth in a given area. It was also felt that, because this is possible, research on micro phenomena in the NHS would be enriched and informed by more general macro theory on organisations and social processes within them.

The third and final stage of the process was the integration and linking of models developed in the field research with existing higher level theory. The purpose of this was twofold. Firstly, by introducing wider theoretical concepts it sought to generate more insightful explanations in the research context. Secondly, this gave an opportunity to contribute to particular knowledge areas.

5.4 Data Collection Methods Chosen

A range of techniques and methods are possible within a piece of qualitative research. Those chosen were participant observation and semi-structured interviewing. These data collection methods are entirely consistent with earlier discussions, as analytic induction stipulates only that the method of data collection should be inductive. It was recognised that choices made can greatly influence the nature of data collected. The full range of possible techniques was, therefore, explored.

5.4.1 Data Collection Methods: Interviews

It was noted that the major advantage of the interview as a data collection method is its adaptability. Interviews can provide structure to the process of immersion described above. They also enable, albeit to varying degrees depending upon the type of interview used, direct interaction between interviewer and respondent. The less restrictive forms of interview also facilitate question clarification, through the minimization of unclear answers, following up of ideas, probing of responses and investigation of feelings and motives. Direct interaction can also be used as a platform from which to gain entry to observe organisational behaviour.

Interviews of different types can be viewed as part of a continuum that is an integral part of the overarching span of philosophical commitments. At one end of the scale are interviews in which the questions to be asked and the choice of response are fixed precisely beforehand. This is the structured or closed interview. This usually takes the form of a questionnaire or checklist, completed by the interviewer rather than the respondent. This is the most restrictive form of interview, for both the interviewer and the respondent. It is the only style of interview where the respondents cannot reply in their own words. However, it is often considered the most reliable form of interview in so far as, if interviews using the same interview instruments were conducted with

another set of similar individuals, the overall results would be the same. It is a standard tool of deductive research.

However, this type of interview is only appropriate when the questions can be determined in advance, when the interviewer can do this accurately (i.e. they can be sure of asking the right questions) and precisely, and the possible response categories are known to be limited, in other words where analytic induction is irrelevant. This was not the case with this research.

Interviews at the other, subjectivist, end of the scale are informal or open-ended. Only the most vague questions can be determined in advance. Such interviews are most useful in situations where the researcher is at the preliminary stage of investigations and there is a need to find out what is of importance and what should be left out. Within this approach the respondents are free to talk about what interests them. However, in order for the activity to have purpose, they will usually know at least vaguely what the research is about (hence reasonable arguments claiming there is no such thing as totally unstructured interviewing, where no particular questions can be determined in advance). These are the least directive interviews. They most closely resemble natural conversation, the only difference being that the information sought is that which is of interest to, and elicited by, the researcher. Such methods are among the more usual precursors to analytic induction. As with analytic induction, they are often seen as producing the most *valid* data. In other words, they can get closer to the truth of the matter and are more likely to yield data that measures or describes what they are supposed to. Importantly, in terms of the trade-off between reliability and validity, an item that is unreliable must also lack validity, but an item that is reliable is not necessarily also valid. It was necessary, therefore, to consider which of these features was most important to this research.

As discussed earlier, the research sought to discover the 'truth' of the matter, rather than attempt to provide empirically reproducible findings, and this general approach to

interviewing was considered most suited to that. This approach enables respondents to present their 'worldview' without being constrained by the researcher's frame of reference. They are able to express themselves in language that suits them. Also the interviewer can respond and has opportunities to expand understanding of what the respondent thinks by 'picking up' on things the respondent says. Lastly, lines of questioning can emerge which might not have been anticipated but which might be highly relevant to the research.

The dangers of this kind of approach are that this kind of interview usually yields a mass of conversational, qualitative data that is not organised around any specific topics. As mutual discretion grows it becomes far harder to control the length and content of the interview. Respondents may 'ramble on' about things in which the researcher has no interest and, conversely, matters of interest to the researcher may not come up in the interview. Data organisation and analysis was, however, taken care of in this research through skillful use of the techniques of analytic induction. In addition, excessive freedom during interviews was curtailed by marginally moving the interview style back along the continuum of formality to incorporate useful but relatively unobtrusive elements of structure. This resulted in semi-structured interviews. This hybrid includes some questions that are completely structured and some that are open-ended. Structured questions are used to obtain factual information, and open-ended questions are used when opinions, explanations or other descriptions of events or behaviour are sought. The level of structure used in the research was increased after the initial tranche of interviews and observation. This was after the initial stages of analysis enabled much more focused data to be sought.

This semi-structured approach to interviewing incorporated, therefore, interview schedules as a loose guide, selecting topics around which the interviews were steered. The respondents were allowed a considerable degree of latitude within that framework. Certain questions were asked but respondents were given freedom to talk about the topic and give their views in their own time. However, the framework also imposed

sufficient structure to ensure all topics considered crucial to the research were covered, thereby eliminating at least some of the problems of the 'unstructured' interview.

This approach also addressed the researcher's perceptions of appropriate interviewing style. The ability for professionals like clinicians and senior executives to talk at will was considered important. This was both for the unexpected data it might yield and because it would be seen to pay homage to their perceived status as experts in their fields, thereby possibly aiding the interview process.

It was recognised that this form of interviewing requires skill in order to keep the interview on course to cover the agreed topics without interrupting the respondent's flow of ideas. It also requires interviewers who are familiar with the subject of their research, as it requires appropriate responses from the interviewer in terms of probing, clarifying and developing lines of questioning, etc. Judging when something is irrelevant rather than just circuitous also requires skill and knowledge of the subject area. It was, however, anticipated that the flow of conversation would be helped by pre-existing relationships between the interviewer and respondents, and pre-existing knowledge on the part of the researcher of the phenomena under study.

5.4.2 Data Collection Methods: Observation

As discussed by Nisbet and Watt (1980: 13) interviews provide important data but they only reveal how people *perceive* what happens, not what *actually* happens. Direct observation can, therefore, be more reliable and more illuminating than what people say in many instances. It can be particularly useful to discover whether people do what they say they do or behave in the way they claim to behave. In other words, direct observation is one of the key ways to explore the important issue of *actual* as opposed to *espoused* beliefs. Of the two styles of observation, the researcher's time in the organisation as a worker and a researcher constituted participant observation. In other

words, this enabled immersion in the life of an organisation to the extent of being accepted as one of the group. This observation was typical of its kind, i.e. unstructured and, as noted by Cohen and Mannion (1980):

‘.... subjective, biased, impressionistic, idiosyncratic and lacking in precise quantifiable measures...’(Cohen and Mannion, 1980: 129)

However, these inherent characteristics were recognised, and this type of observation was therefore useful in generating notions of the kind of ‘foreshadowed problems’ discussed earlier. During the main research phase such observation was possible because of the strong network of relationships, and level of understanding of key constituent factors in the problem domain, which had built up during the researcher’s time as a worker in the organisation. Observation in this stage was, however, more focused than it had previously been, as it came at a point when the research problem had been defined and partially explored. Approaches used to structuring observation did not equate to it being described as fully structured. This would have entailed the recording of events in a programmed manner, usually requiring some form of pre-programmed and formalised schedule. Rather it followed the sorts of principles applied to structuring interviews. Observational settings were, therefore, chosen with loose goals in mind, and both observation and discussion took place.

5.5 The Researcher’s Role

As well as preparing the style and content of interviews and observations, consideration was also given to the role, status and effect of the researcher in this process. As discussed earlier in this chapter, in the tradition of most ethnographic research, this qualitative, interpretive account was concerned with inductively generating descriptions and explanations of particular phenomena and with developing theories, rather than with testing preconceived hypotheses. Naturalistic though this approach could be argued to be, it did not constitute adopting the full range of naturalistic assumptions. This was not least because these include a belief in a distinction between science and ‘common

sense', between the activities and knowledge of the researcher and those of the researched. This is an assumption, ironically, shared with the positivistic approach, which is diametrically opposed to naturalism in so many other ways. Both fail to recognise the researcher as part of the socially constructed reality they observe, as though the act of observing, rather than being a fundamental tool of social construction and negotiation, is somehow, for the researcher, a context-liberating activity. Both hold the belief that, using their preferred and very different methods, it is possible to eliminate the effects of the researcher on the data and thereby isolate a body of 'uncontaminated' data. This rejects the concept that the researcher, like all social beings, creates and recreates 'reality'. (It possibly also rejects the notion that all social research is based on the human capacity for participant social observation. However, rigorous definition of the word 'social' would be required before taking this line of argument further.) We act in the social world but are also able to reflect upon our actions and ourselves in that world.

It was a central tenet of this research, as discussed by Hansen (1958) that the researcher is, to an extent, a product and an integral part of the social world being researched, and that all data and methods involve theoretical presuppositions. This research recognised, therefore, a reflexivity in social research that implies the orientation of the author is shaped by socio-historic location, including the values and interests these locations confer upon her. The researcher was also inescapably bound by use of common-sense knowledge and methods of investigation. The idea that social research can be carried out and its findings expounded in some autonomous realm was rejected.

It was also, therefore, a tenet of this research, as discussed by Hammersley and Atkinson (1983) that research is an active process in which accounts of reality are produced through selective observation and theoretical interpretation of what is seen. They are produced through asking particular questions and interpreting replies in particular ways, and all research has consequences or effects on the social world, even if only through the process of doing it. None of these factors per se diminishes the

validity of any data gathered or conclusions drawn. Methods of gathering data, including the researcher, must simply be taken account of in interpreting findings. All methods are influential in some way. As discussed by Sellitz et al (1962) social anthropology has shown that if any two people are in a meeting, particularly where they are strangers, a series of social actions and effects rapidly takes place. Hence, for instance the attention paid by politicians and salespeople to dress, tone of voice, wording of questions and statements, physical demeanor, etc. This is social behaviour at its most basic and pervasive level. Adding the context of researcher and respondent does not expunge it and may extend it. For instance, this could be the case where the content of the discussion is directly relevant to the respondent: where it threatens job or position, where it calls upon expert knowledge, etc. Thus there are a range of effects, including what is commonly called 'bias' inescapably precipitated by the human (researcher) in action. As noted by Sellitz et al (1962):

'Interviewers are human beings and not machines.' (Sellitz et al, 1962: 583)

However, given earlier comments on machines even these would colour the proceedings.

Neither is this a one-sided issue. As noted by Borg (1981) in his discussion of 'response effect':

'Eagerness of the respondent to please the interviewer, a vague antagonism that sometimes arises between interviewer and respondent, are but few of the factors that may contribute to biasing of data obtained from the interview.' (Borg, 1981: 87)

It is also even easier to lead in an interview than in a questionnaire. Varying emphasis and tone of voice can dramatically alter the communicated information content of a question and, therefore, the response. Also, as mentioned above, it is probably impossible to definitely eliminate all bias or researcher/respondent effect. However, knowledge of its existence, vigilance and conscious self-control can help minimise its

unhelpful effects. For instance, self-knowledge that the interviewer holds strong views about an issue can enable greater care in wording questions. Self-knowledge can, however, also have a more positive aspect. Remaining effects should not be perceived merely as diminishing research integrity. They should instead be analysed with the rest of the data as different, but potentially equally useful, parts of it. Also, as discussed by Hammersley and Atkinson (1983) the ways in which individuals respond to researchers can be as important a source of data as the actual responses themselves. As noted by Schuman (1989) research can be:

‘.... a search for meaning, and ambiguities of language and of interviewing, discrepancies between attitude and behaviour, even problems of non-response, provide an important part of the data, rather than being ignored or simply regarded as obstacles to efficient research.’ (Schuman, 1989: 21)

In this approach, then, the researcher becomes part of any research instrument designed. While not an explicit objective of this research, this approach enabled exploration within the full context of the social world. It also admitted into theorising the effects of interpretations and their respective limits, and exploration of the benefits of alternative approaches.

5.6 Research Design and the Application of the Methodology

In this section the application of the method is discussed. The approach taken to the research is presented, as it was carried out, and the emphasis is on the technical and pragmatic aspects of the research design. This involves three main areas: contacts, sample frame, interviewing and observation. The initial results of this process, first phase analysis of the data, are discussed in the next chapter.

5.6.1 Research Participants

As stated above, the fieldwork phase of the research undertook to examine the validity

of the theories emerging from the literature review. It sought to do this by focusing on technology, organisational context, systems and the key stakeholder groups. This helped to define the scope of this phase, as it required the researcher to identify, contact and gain access to a number of relevant organisations, people and systems. While this was a major objective and achievement of the research, it was helped significantly by the researcher's previous background in the NHS and DH.

Relevant organisations and people were those involved at all stages of the authoring and use of the knowledge, data, information and processes being studied. These are described in the Macro Information Systems Flows model (Figure 2). The participants sought, therefore, were practicing senior NHS Consultants (clinical) clinical coding staff in NHS Trusts, Business and Information Managers of NHS Trusts, senior statisticians working in the DH Statistical Services Division, and policy makers to the level of Under Secretary of State for Health. Also sought were developers and implementers of the information systems used to code clinical knowledge. Apart from ensuring data collected was representative of all key groups and systems involved, this spread was used also to strengthen the validity of findings, as those coming from each key group were checked with relevant other groups.

Regarding the particular contributions that were sought from interviewees, senior clinicians were involved because they generated and applied clinical knowledge and created the document used as the source of classified clinical data for the DH. NHS clinical coders translated that clinical data into coded and classified data. NHS Trust managers had administrative responsibility for the data and its quality, and for submitting it to the DH. They also had it in their gift to use it in running their hospitals. Senior DH statisticians were involved because of their role in handling the data. Understanding the perceptions all of these groups held of the data was considered to be as important as gaining insights into the processes in which they engaged. Policy makers to the level of Under Secretary for Health were involved for the same reason.

In addition, where it was possible (i.e. they were still alive) those who had designed the 'transformation' systems in question: Read, ICD-10, OPCS-4, and HRGs were sought. These individuals, better than any others, could provide insights into the design process and intended application(s) of their systems, together with comments on current applications where these differed. Knowing their systems and purposes so well, they could also comment on their perception of the validity of any data being generated by them. Where the original designers were not available, current 'expert' users were sought, preferably those who had significant involvement in the further development of one of the systems. These individuals would be only one step removed from the initial design process and could have at least as profound an influence on the current development and applications of such systems. They could also provide insights into why the systems were as they were, and comment on data produced by them.

Lastly, also sought were those who felt the effects of the application of this knowledge, including, once again, clinicians. This would close the circle by bringing the offspring of their original clinical knowledge back to the clinicians. This would also enable exploration of the perceived truth of clinical data among these disparate but interlinked groups.

Further definition of the scope of the research then took place. This involved defining where interviewees would be drawn from and where observations would take place. For interviewee selection, some areas were self-defining. There was only one DH Statistics Dept. There was only one Policy branch dealing with clinical data. In both of these areas, in order to try to get a spread of views, the researcher sought out both policy makers and individuals more directly involved with the data. There was often only one inventor or primary developer of a system, and these were approached. There were, however, thousands of clinicians, coders and NHS business managers. The researcher's own network stretched to hundreds of such individuals. Access was not, therefore, a determining factor. However, a realistic timescale for the research was. Selection was made, therefore, in order to provide a representative sample of data in a reasonable

timeframe by ensuring a geographical spread and also a mixture, in terms of clinical specialties, primary and secondary care, size of hospital and coding models in use. All of the individuals approached, apart from one, agreed to participate. The same was true for selection of hospitals and departments for participant observations.

With regard to confidentiality, many of the individuals approached requested that their identity be withheld from this document. They were, however, happy for broad job titles to be used. This enabled the researcher to respect confidentiality requests, particularly where an individual's role was unique, as it sometimes was. It also still enabled the researcher to demonstrate two important things. Firstly, their relevance to the research could be shown. Secondly, it enabled her to demonstrate that representatives of all key stakeholder groups were involved. Reasons for confidentiality restrictions varied, but a strong theme was sensitivity over a focus on healthcare information systems that might raise issues about allocation of public funds. The organisations and general level of the individuals have, therefore, been identified but the individuals themselves have not been named.

With these criteria in mind the following list of interviewees was approached. The list has been divided as far as possible into the respective key groups described above. On occasion participants fulfilled more than one role, for instance as system inventor and policy maker. Where this happened it is indicated in the description of their role, and they are listed in the primary group for which their participation was sought. Full advantage of multiple expertise was, however, taken during interviews, where appropriate and possible, by also exploring insights relating to participants' other areas of expertise. This was particularly useful where clinicians had crossed the cultural divide from active clinical work to statistical system development. The following list details the interviewees. It is presented by occupational group.

Clinical participants were as follows:

-2 Consultant Physicians, who were senior working clinicians. One was an influential member of The Royal Colleges Conference Information Group (CIG) a worker on behalf of Read 3 and clinically rather than statistically derived classifications. He also worked at senior levels for the WHO UK Collaborating Centre for ICD-10, and had worked on the management team of an NHS Trust.

-3 Consultant Surgeons, who were working clinicians. One was a key worker in development of HRGs for Urology. He also implemented Read 3 within his clinical practice.

-Consultant Surgeon, who was a senior working clinician, and represented his Royal College at CIG. He had also been influential in development of Read 3.

-Consultant Surgeon, who was a senior working clinician, a key figure in the development of HRGs, and a key user of these in everyday clinical management

-Consultant Surgeon, who was a senior working clinician and represented his Royal College on CIG. He also worked at senior levels on development and implementation policy for Read 3 and ICD-10 and OPCS-4.

- GP, who was a key figure in development and use of Read codes for General Practice.

NHS Business and Information Managers were as follows:

-Director of Operations (Business and Information), NHS Trust, with responsibility for ensuring that the Trust had the information needed to run its business and the DH received the required statutory clinical data returns in ICD-10 and OPCS-4 format.

-Information Manager, NHS Trust, with responsibility for ensuring Trust managers and clinicians received the information needed to run their businesses, for

implementing Read 3 in his Trust, and for development and implementation of the host computer system for Read 3.

Statisticians were as follows:

-Senior manager, Office of National Statistics (ONS) London, who was both a trained clinician and a statistician. This organisation was responsible until 1997 for processing, analysing and publishing the clinical and administrative data sets, which are a focus of this thesis. He continued to have involvement with analysis of this data, although processing had been taken over by an external data processing company.

-Senior manager, ONS, who was both a clinician (retired) and a statistician. He was responsible for operational management of the functions that processed, analysed and published mortality data. He was also responsible for helping development and implementation of policy in this area. He had significant insight into the ICD classification and influence on its revisions.

-Senior Civil Servant and manager, Hospital Episode Statistics (HES) Section, DH, who was involved in directing and management of collection, analysis and use of HES from NHS hospitals, for monitoring and improving its quality and promoting its use by the NHS. Customers included DH Policy Development Section, Ministers, epidemiologists and medical researchers, managers requiring comparative statistics to assist in Performance Management, and the Treasury, which used the HES data to help determine how much of tax payers money should be spent on healthcare and how it should be distributed.

-Senior Civil Servant and manager, HES Section, DH, who was involved in 'cleaning' of HES data, managing its analysis, and promoting its use.

Policy makers were as follows:

-Senior Civil Servant and manager, with key involvement in policy on the development and implementation of Read codes and clinical classifications for the NHS.

-Senior Civil Servant, manager and clinician (retired) National Case Mix Office (NCMO) with key responsibility for directing policy in the development and implementation of HRGs in the NHS.

-2 Senior Civil Servants, Policy Implementation Section, Information Management Group, NHS Executive, with responsibility for improving the quality of the HES data submitted by Trusts to the DH.

-Senior Civil Servant, manager and statistician, Statistics Division, DH, who was involved with directing and managing the collection, analysis, interpretation and publication of a range of health statistics, including the data sets (HES) which are a focus of this thesis. Customers included Ministers, internal departments across the DH, research and academic institutions, international organisations, statistics organisations in other countries, the independent health sector and the general public.

Systems developers were as follows:

-2 Senior Civil Servants, managers and researchers (NCMO) with key responsibility for directing statistical analysis for HRG development and undertaking the clinical interactions necessary to the continued development and implementation of HRGs.

-Senior Civil Servant and statistician, NCMO with responsibility for refining HRGs into the most incisive statistical tool possible. He also contributed to negotiations with clinicians about HRG refinement.

-Senior manager in Epidemiology Surveillance and Statistical Services, WHO,

with pivotal responsibility for coordinating and rewriting revisions of the ICD classification and for promoting its use internationally.

Other data users were as follows:

-Epidemiologist and Medical Researcher, ONS, with responsibility for interpreting HES data and producing conclusions and recommendations for healthcare practice and management on the basis of it. The work in epidemiology involved using clinical data sets to identify and understand variations in patterns of illness and death and to enable comparisons between different populations.

-2 Medical Researchers, with responsibility for analysis of specialist medical data sets for the purposes of medical research. They wanted to use statutory national data sets but felt they could not due to issues concerning the inadequacy and irrelevance of their content.

Fifteen clinical coders from the coding departments of 3 NHS Trusts were interviewed or observed.

For observation purposes the aim was to observe the process of knowledge creation and application, and also of computerising and coding. Observation was not sought further along the information chain, as human activity at those levels was minimal. Data was for instance, therefore, collected in Trust information departments and DH statistical departments by interviewing. 3 NHS Trusts were sought who would allow access to both clinical and coding departments. Factors considered when selecting Trusts included the fact that the social context would be explored. Some factors were constant. All Trusts must produce medical casenotes, and statutory datasets using ICD-10 and OPCS-4. There were, however, known to be organisational differences, the effects of which could not be predicted. Accounting for all organisational variance was not possible in a reasonable timescale. Trusts were sought, therefore, where a range of contextual factors considered to be relevant and key could be observed. These factors

were spread of clinical work and experience, and models and experience of coding clinical data.

5.6.2 Gaining Access

The approach to interviewing took account of the fact that most of the individuals involved operated at very senior levels, and had very full work schedules. For that reason, rather than assume it would be possible to interview each one more than once, it was decided that more than one of each type of individual would be approached. This would also help to strengthen the credibility of any findings.

No researcher can demand access to an organisation or to materials. Permission to carry out the research was sought early, prior to registration of the research proposal, and at senior organisational levels. Wholehearted endorsement was secured. This was due to a supportive organisational philosophy towards professional development, and also because the research had the potential to yield important information for the DH. In addition, the author had worked within the host organisation until the end of 1996. This had the advantage of providing an established set of good professional relationships and, therefore, a network of relatively easy-access contacts. It also provided in-depth knowledge of the subject areas and context of the research, of the macro and micropolitics of the organisation and of the organisation generally. Furthermore, it gave insight into how best to approach different individuals and an appreciation of some of the issues they faced. It was thought likely that ex-colleagues would welcome the chance to air problems and to have their situations analysed by someone who understood the practical day-to-day realities of their work.

Stepping outside the organisation for the fieldwork phase also had advantages. It made objectivity easier to maintain and avoided the risk that obtaining confidential information could affect the researcher's relationship with ex-colleagues. It also freed

the researcher in terms of time and enabled a more broadly based group of contacts to be recruited. Ex-colleagues were, even so, being generous and needed to be advised of exactly what would be expected of them in terms of subject matter, length of discussion and use of any data produced. They also had to be convinced of the value of the research, and that strict ethical standards would be observed at all times. This was particularly so in terms of confidentiality where required, and honesty regarding the purpose of the research.

In terms of contacting interviewees, given the highly professional nature of the respondents, introductory letters were sent. These briefly, and in lay terms, re-introduced the author as a researcher and described the research. These letters also contained appendices containing a more detailed description of the work to be undertaken. All interviewees were quite used to reading documents of this complexity. The details were amended only slightly, depending upon the recipient, to ensure that implicit criticism of the data on which the NHS runs its business did not emerge. The reason for a 'lay' front sheet was to effect a gentle introduction. Then, if time or inclination did not allow for reading of the appendices, this would still provide an adequate flavour of the research and requirements of the researcher and respondent. The letters also gave reasons for the approach to them, requested their participation and assured them of anonymity should they require it. They also assured them that initial meetings would take no more than one hour of their time, and be at a place and time to suit their convenience. These conditions were seen as crucial, not only to gaining access in the first place, but also to ensuring further access, both for the author and any other researchers if necessary. This respect for respondents was considered fundamental to the ethics of social research.

This final style and content of approach were based on the researcher's experience and also on piloting with one clinician and one manager, who advised what would best suit their respective peer groups. A supplementary reason for this approach was that, as discussed above, the author was known in a professional capacity to most respondents

and they were aware that she was engaged in a PhD researching information in the context of healthcare. There was, therefore, an expectation of a certain level of explanation about the research. Lastly in this regard, spontaneity of response was not perceived to be essential. Advance notice would not, therefore, invalidate the research. Where appropriate, official channels were written to first in order to request permission from senior managers to approach members of their staff. This correspondence was followed by phone calls to resolve initial queries and to arrange time, date and place of interview.

As a result of the above process, all of the above prospective participants were interviewed, with the exception of the senior manager at the WHO. This was due to logistics, as he was based in Geneva. This was not seen as unduly damaging to the research, as it was always considered to be a 'nice to have' rather than an essential. A number of local individuals listed above, including senior Civil Servants and clinicians, were able to provide a range of responses to all of the questions he would have been asked, and between them provided the necessary breadth and depth of experience.

Interviews during the fieldwork were undertaken in two tranches. In the first tranche, 30 interviews took place with senior clinicians, epidemiologists, healthcare statisticians, healthcare managers and government officers.

The above process of interviewing also resulted in agreement to participant observations, which were undertaken in three NHS Trusts that met the criteria described. They were geographically distant from each other, of different sizes, and one was a teaching hospital. This meant that a different range of clinical work and experience was seen. Also, the two main models of coding, centralised and dispersed, were in operation and could be observed. These result in different levels of proximity to clinicians. One used the dispersed model, where coders worked in clinics and on wards, with good levels of access to medical casenotes, but less access to clinicians. The other two had a centralised coding function, where coders worked in an office and medical

casenotes were brought to them periodically. Lastly, coders varied in the length of time they had spent in the job and the levels of training they had received, which ranged from none through to the national standard training package.

These observations developed into a second tranche of a further 20 interviews with selected individuals. The following table summarises the total numbers of interviews carried out by occupational group. Some were second interviews and, as stated earlier, within each interview participants' other areas of expertise were also explored where appropriate and possible. For instance, 6 participants listed in other groups for their primary role in the research were also clinicians and some of their clinical views were explored. Quite often such expertise was somewhat historical, and variable in relevance, so the table has not been developed to incorporate these contributions. However, handled carefully, they were a useful supplement to the number of primary insights for each group.

Primary Occupational Group	Total Number of Interviews
Clinicians	12
Business & Information Managers	4
Statisticians	5
Policy Makers	6
Systems Developers	4
Other Data Users	3
Coders	16

Table 5 Summary of Number of Interviews by Occupational Group

Interviews and observations in the research phase went on over a period of 18 months.

Interviews usually lasted between one and two hours. Each observation lasted three days. Three clinical and three coding observations were undertaken. All interviews and observations were conducted during the participants' working day and at their places of work.

This was supplemented by the researcher's extensive experience working with NHS clinical data over a period of four years prior to the active research phase. This involved participant observation in over 30 hospitals during the development of the research question.

5.6.3 Interview schedules

Preparation for the interviews, in terms of the frameworks or schedules, followed much the same procedures as it would have for developing a questionnaire. Topics were selected that were of relevance to each respondent, questions were devised to elicit the relevant information and methods of analysis were considered. A schedule including the probable best order of discussion was also prepared. Questions were chosen on the basis of indicators from the literature review. Broadly, they were directed at gaining understanding of each participant group's 'reality' and of how that influenced behaviour in terms of information and knowledge. Each interviewee was also allowed latitude in terms of digression into areas of personal interest. This was both in order to aide the process of establishing a rapport and because the researcher's previous experience (Drennan, 1991) indicated that such digressions often yield unexpected value. The researcher had a sound knowledge of the work areas involved and so was able to promote useful conversation in unplanned areas, and relate that to the appropriate research issues. Wording of the questions was given considerable thought, particularly to ensure that more than one question was not wrapped up together and to give consideration to the effects one question may have on another. It was recognised that some questions could start respondents thinking along certain lines and affect how they answered further questions. Consideration was also given to whether questions

contained unstated assumptions. For example, the question 'What kind of data do you use to manage your clinical activities?' assumes use of data and management, and that a link between the two exists. Also considered were the kinds of responses the questions could lead to and whether or not these were the kinds of responses being sought. In addition, assessments were made of whether questions conveyed what the researcher thought, and whether this was always desirable. Lastly, leading, presumptive, sensitive or offensive questions were avoided. This type of consideration apart, the wording of questions was not considered to be important in the same way as for questionnaires. The interview style selected offered the ability to give and seek clarification, to change the order of discussion, to omit issues and to probe further where necessary. It was deemed important, however, that efforts were made to ensure the language used was understandable to respondents. The interview schedule was also designed to keep interviews to approximately one hour per respondent; respondents were mainly professionals working in highly pressurised environments. Lastly, the schedule was designed to ensure the needs of the interviewer were met in terms of enabling an efficient and comfortable interview. Interview topics were clearly written out to avoid embarrassing silences while the right issue was found.

As stated above, pilots were undertaken. These yielded useful data, which was assimilated into the general set collected, but no substantial changes to the approach resulted.

Interviews were recorded by making notes both during and after the interviews. Taping interviews was considered because it was recognised that semi-structured interviewing often yields a mass of data. However, transcription was considered intrusive by most interviewees. This was not unexpected from individuals who wished to remain anonymous. Other participants, for instance clinical coders, could only be interviewed in open offices where noise levels prohibited taping. Also, the researcher's extensive background in the problem situation meant that a great deal of information could be retained on the basis of relatively few notes. Lastly, although taping captures

everything that is said, transcription is a laborious process. It was considered that an equally good or even better result would be achieved by careful management of the interviewing process, and the process of writing up thoughts immediately after each interview. These notes were later reviewed, participants' responses were compared and future interview plans were adjusted where deemed appropriate.

Both the process and style of interviews were done primarily in such a way as to both ensure a continuing focus on the specific research questions, and to assist identification of emerging, overarching issues or conceptual categories. These are addressed in the following chapters.

Chapter 6, The Problem Addressed through the Data

This chapter contains findings from the first report of the fieldwork. It begins by discussing the process of analysis in terms of physical organisation and exploration of the data. It then describes and explains the development of conceptual categories. This part of the discussion begins with the final analytic categories. A detailed account of their emergence is contained within the main report of the fieldwork, as they sit more naturally alongside the events that precipitated them. They are included here in order to demonstrate their relationship to preceding analysis. The discussion moves then to early stages of the analysis phase, with description and discussion of the initial analytic categories, followed by some examples from the data analysed which explain the emergence of those categories. Some of these examples are repeated in the body of the analysis chapter as they relate, as might be expected, to development of the final categories as well as to early thoughts. Discussion of these early categories is included because it provides insight into underlying thought processes and reasoning which ultimately shaped the final argument. It is hoped it will, therefore, provide insights to the final argument itself.

6.1 First Level Analysis: Process

The approach used in the research sought to:

‘.... elucidate case features so as to facilitate the development of an explanatory framework.’ (Gill and Johnson, 1997: 13)

This entailed ‘progressive focusing’ (Hammersley and Atkinson, 1983: 206) with a shift of concern from description to the development of grounded theory (Glaser and Strauss, 1973) based on analytic categories, by explicit reference:

‘.... to their involvement in a complex of inter-related variables that the observer constructs as a theoretical model...which best explains the data...assembled.’ (Becker, 1970:196)

The explanatory theory would, therefore, rest upon relationships between key concepts derived from the data. Achieving this involved organising the data into a series of categories. In practical terms this followed the work of Turner (1981):

‘The qualitative researcher needs at least two sets of notes or files for data analysis. The first, conventional set will, of course, permit the recording of field data in any way which makes it readily retrievable. But the second set of research records is the one which makes it possible to manipulate and analyse the data collected, and to develop a theoretical understanding. Through this second set of records the researcher develops a gradually changing abstract representation of the social world which can be rearranged to let new aspects of its properties become evident.’ (Turner, 1981: 230)

Thus concepts were derived from the data and the process of collecting it, and some analysis was contemporaneous with research. This process went on throughout the fieldwork and after its completion. Notes were reviewed and a process of sedimentation was pursued, which extracted phenomena and perceptions from the general mass of data being collected. These were then added to, grouped and regrouped according to similarities and differences. This grouping and regrouping was done on A5 size cards, on which each potentially related concept, issue or phenomenon was listed. This made all of the data very accessible, thereby greatly assisting the process of analysis. Categories were then derived from the data on each card. These reflected common conceptual areas under which the listed items could be said logically to fit. Eventually, a point of saturation was reached in recording, grouping and regrouping. At this point new categories had ceased to emerge and it had become impossible to add to the properties of existing categories. Fieldwork was then deemed to be fully mature and analysis moved to identifying deeper levels of categories and possible new explanatory theories.

6.2 First Level Analysis: Findings

The analysis described eventually crystallised around four major categories. These were The Clinician as Scientist, Artist and Professional, which was nested within a

larger concept, Socially Constructed Realities. To these were added the concepts of The Social Rationalists and, lastly, of Conflicting Realities.

The process leading to these predominant and lasting categories began with the interviews, observation and analysis, which initially yielded, and were allowed to yield, a fairly large number of what were considered to be 'themes of interest' rather than firm categories. This was due to two main factors. Firstly, it was recognised that ability to more accurately label or describe findings would improve as understanding developed, so initial labels for categories were expected to be imprecise and, sometimes inaccurate. Secondly, it was due to a desire to allow the data to 'move' during the analysis stage. In other words, this was to ensure that early assumptions did not retard emergence of new links and relationships, which could emerge, dissolve and re-emerge as understanding developed. The order of these themes as described here is purely for presentational purposes and does not reflect the order in which they emerged during the research. This is mainly because some were simultaneous during focused analysis phases and some slowly emerged over a period of protracted and less focused thought. Also, there is no implied assertion in this that the categories, connections, and subsequent assertions made are the only valid connections possible, merely that they have been justified in terms of the data available and are, therefore, a valid interpretation of the issues.

Key early categories preceding the final analysis classes were numerous. They included Modelling Reality; Communications and Knowledge; Knowledge Gained and Purpose/Need; Models of Inquiry and Knowledge Gathering; The Nature of Two Businesses; Politics; Culture; Accounting by Objective Means; Organisation; Pragmatic Management; Bureaucratisation; Assumptions; Knowledge as Truth; Knowledge Domains; Systems and, lastly, Data. As may be expected, given that the findings were generated by one 'problematic' aspect of the organisational situation, even at this stage it was clear that some links and overlaps existed between particular categories, resulting in their being clustered together and forming the platform for the final categories. These are perhaps best explained by discussion of some of the findings that underpinned them.

The category Modelling Reality arose from findings of the type elicited from a clinical coder that:

‘.... all the information needed (by the classifications) is in the casenote.’

This stimulated consideration of different approaches to modelling reality, as did the following claims by clinical participants:

‘.... the two domains (of ICD-10 and OPCS-4) are just different’

‘.... clinicians wanted terms outside the scope (of ICD-10 and OPCS-4) to record the detail of their patient encounters.’

This and other related findings indicated, very clearly, that disparate ways of modelling reality were at work. This was not in itself problematic until consideration was given to the fact that the universe of discourse, and the knowledge sought about it were apparently thought, by the DH and the Government at least, to be the same.

A second theme which emerged was Communications and Knowledge. Findings underlying this concept included discussion with the designer of Read codes, in which he advised that the way the Read system is organised:

‘.... reflects the way doctors are trained in medical school to deal with patients It has a clinically meaningful hierarchy for navigational purposes, to help clinicians find things where, according to their clinical training, they would expect to find them.’

Findings like this indicated it would be worthwhile exploring the issue of clinical knowledge and how that affected communicated information. Findings here also included clinical assertions relating to the contents of the medical casenote, which was the key communication document in this situation. As one clinician put it:

‘The level of detail sought and recorded varies according to the needs of each clinician taking care of each patient.’

This quote also featured in development of the next category, Knowledge Gained and its relationship to Purpose and Need. The relationship between these categories is clear and rests on the notion that knowledge gained is related to purpose and need, and this affects what is, and can be, communicated. However, at this stage the separation was useful as it was thought possible that these closely linked issues may have other and different links and drivers. Other findings of relevance to this Knowledge category included comments by an Information Manager, when asked whether he was concerned about the accuracy of clinical coding, because that determined the amount of money paid for a healthcare contract. He responded:

‘So long as the money coming back in is roughly right, who cares?’

They also included the clinical assertion that:

‘Often in reality a doctor will decide what is wrong with a patient by looking at them coming in and will often tend to write down what supports that.’

And that of a clinical coder:

‘The casenote was extensively searched for the information regarding the overdose, as the clinician had not recorded it, but the ICD requires this information.’

The notion began to emerge, as a result of this type of finding, that examination of purpose and its relationship to both information gathered and perception of it might be useful.

The next early category, Models of Enquiry and Knowledge Gathering, was closely allied to the first. Comments of importance here included one from a statistician, when discussing the DH department, known as the HES Office or HES, which provides Government healthcare statistics:

‘HES exist to provide consistent information about Health Service activity ... cleaning and manipulation of data are necessary to support this’

and, from a clinician:

‘There is no nationally accepted or supported standard for the structure and content of casenotes’

and, from another statistician:

‘HRGs need to be resource homogeneous and clinically meaningful.’

These kinds of findings opened up the possibility that the systems in question, the tools themselves, bore examination, as many aspects of them, including their rationality, their requirements and the inherent view of their portion of reality was clearly influential in determining the nature of information being transferred.

Moving on to the category ‘The Nature of Two Businesses’, this was developed in an effort to understand the effects of the business of caring and the business of resourcing, in which the two main groups active in the problem domain, clinicians and managers, were respectively engaged. For instance, a coder noted, when discussing the rules of the classifications and the fact that her job in extracting the classifications’ data requirements from the medical casenote was sometimes so difficult:

‘The doctors aren’t interested in them.’

Also, as one manager described:

‘Managerial data is about waiting list times.’

and another:

‘The Department of Health has to account to Parliament and the only way it can do this is in terms of what is spent by showing activity.... The Department of Health needs information for planning, policy development, monitoring and implementation planning.’

This was in stark contrast to the earlier quote (see page 152) from the clinician for whom the level and type of detail extracted from a situation, and recorded about it, related directly to their own individual clinical needs in caring for each patient.

The category of Politics, both in the Governmental and organisational sense was almost inevitable, given the nature of the problem domain, wherein the Service is Government funded, but delivered by a strong professional group. However, the effect of these factors was significant in terms of information and information tools. For instance, as one researcher put it:

‘HRGs were originally designed to enable understanding of departmental casemix in hospitals so that hospital budgets could be rationally allocated.’

HRGs were, primarily, therefore, a management tool necessary because equity of service delivery and accountability for public funds was a key fact of NHS life. A senior DH manager added further support in this area when discussing the role of the HES Office:

‘If HES cannot *confidently* say to Ministers that, for instance, 73% of the population has had or, more importantly, will have a heart attack, there is no point in them being there.’

Organisational politics were also clear in comments from clinicians. For instance, in discussing the development of their clinical language, Read 3, a number raised the fact that the DH was very keen to have classification concepts included. As a developer said:

‘They (the clinicians) balked at the inclusion of ‘non-clinical’ terms in order to satisfy the needs of a system they had long despised. Several mechanisms have been introduced to smooth this problem.’

The issue of Culture, which is so intimately involved with organisational politics, and which plays a role in informing and reflecting the worldviews of individuals and groups, was also considered a worthwhile issue upon which to focus. This was on the basis of

very different assertions by key stakeholder groups. The following clinical view was typical of comments reflecting on the tentative nature of much clinical work:

‘From their earliest clinical training clinicians are taught that in science the person with most doubts about the result of an experiment is the person who did it.’

No such doubts assailed clinical coders, whose job it was to extract definitive clinical statements wherever possible from medical casenotes:

‘If only doctors would write everything down they were supposed towe could really improve things.’

A similar belief system operated for the statisticians also, whose job it was to ensure the Government had the data it needed:

‘Grossing (of clinical data received at the DH) involves compensating for missing diagnoses and procedures in HES (data) and helps to ensure consistency and comparability across the whole database.’

Clearly, very different agendas were being pursued and each group involved perceived their methods as legitimate. This type of finding also stimulated development of the category of Data as a separate theme.

The last quote above also featured in development of the category Accounting by Objective Means. Other relevant findings here included findings from discussions about HRGs, some of which are related above. This issue was also closely allied to cultural concerns and the notion of different agendas driving different perceptions of reality and information needs, and also of those factors, for clinical as well as non-clinical groups, perhaps constraining what could be known about reality. This category was also influenced by assertions from, for instance, a Government statistician, discussing the HES office:

‘HES exists to provide consistent information about Health Service activity To answer questions It exists in the belief that they can be answered and

answered from hospital data. It follows their actions are designed to make this belief a reality, not to question this belief.'

In other words, each group seemed to be locked into a concern about, and a relationship with, certain parts or types of reality. This seemed to be driving assumptions which influenced interaction with reality to a significant degree.

Organisation developed as an early category in order to ensure a focus on any relevant effects emerging from the 'Professional Bureaucracy' (Mintzberg, 1983: 191) which is the NHS. Of particular interest, bearing in mind Giddens' work on 'structural conflict' (1976, 1984) was whether this arrangement had informational consequences. The type of finding of importance here was, for instance, revealed in discussion with a member of the HES office:

'Detailed information about psychiatric patients is produced by HES Clinical staff provide coders with only the most bland and superficial statements about their patients.'

While this kind of issue clearly related to differing realities and agendas, it was thought possible that organisational arrangements also colluded in enabling this type of thing to happen.

The next category, Pragmatic Management, arose from a number of observations, which demonstrated something about the effects on information of the relationship it had to its handlers. For instance, a coding manager described how:

'The coding backlog was so great that quality had to be sacrificed for quantity. This meant that all orthopaedic conditions (treated in the hospital by clinicians) were coded as backache, irrespective of the real condition described by the doctor (in the casenote).'

Bureaucratisation as a category emerged at an early stage as a result of work by Dalton et al (1967) briefly discussed in an earlier chapter. They noted that functional differentiation, like that found in bureaucracies, is not only about division of labour and

responsibilities, but is also concerned at a much deeper and, for this thesis, more important level with the difference in cognitive and emotional orientations, cultures and loyalties between differentiated groups. The informational effects possible as a result of this have already been demonstrated in some of the above quotes, but were also demonstrated by the very different information tools and methods in use by each group. Thus, for instance, the bureaucrats' preferred tool was a highly structured and definitive classification.

Like so many other categories, Assumptions is a thread which can run through most others. However, once again its development was in part to ensure that assumptions in their own right were disentangled from the other data, at least until such time as their effects were felt to be better understood. Findings of interest here included the following from a DH manager, discussing the processing of clinical data:

'The process from top to bottom for this data is very distended and it is unlikely that each handling centre understands properly what it is they are getting and the effect of what they are doing. A great deal seems to be taken on trust or assumption.'

Thus the notion that significantly different assumptions might be at work gained importance, particularly when considered together with Modelling Reality.

Modelling Reality also closely linked with the next category, Knowledge as Truth. This category was particularly underpinned by, for instance, the assertion of a researcher involved with HRGs:

'I also believe that, in order to have good statistical data you need data which is objective or *perceived* as objective '

and, from a clinician:

'Reservations (about data) get buried and assumptions are what get carried forward.'

The category of Knowledge Domains arose from insight into the focus of clinical work and the apparently identical focus of the classifications. Findings quickly revealed a difference of opinion among key groups in this area. Thus, as one researcher put it:

‘Clinicians criticise the structure of ICD because there are conditions which are not described in their terms with an ICD code and it does not enable them to see a true picture of what is happening.’

A clinical participant, who echoed an earlier clinical response, went further:

‘Clinicians wanted terms outside the scope of the classifications to record the detail of their patient encounters...’

Moving now to the Systems category, again, a number of the above-mentioned findings featured in its development. Of particular relevance also was the fact that the computerised and manual systems in the problem domain were seen from the early stages as key features for investigation, given their role in processing clinical information. Also, however, findings from participants like:

‘The Read 3 system would be designed specifically for use in computers. We saw the need for compatibility with the established systems (when designing Read 3).’

indicated that the technical aspects of these systems were only one important feature in understanding informational effects. Their design rationales, etc. would also prove worthy of investigation, as these should reveal inherent and influential worldviews.

Lastly, a category entitled Social Structures was developed. Interestingly, when it emerged it was not possible to ascribe to it any particular findings. However, it reflected the first of a series of moves away from the above-mentioned, somewhat scattered categories towards higher level themes. A more all-embracing explanation, which was perceived to be emerging, was the influence of social positioning and structures on perception and action. A useful starting point to developing this notion was deemed to be consideration of information in the context of each key group in the

problem domain. Thus, the analysis would consider not only the nature of information in each of those contexts, but also the constellation of what were perceived as relevant social phenomena active within those contexts. It was felt this would be likely to draw on several types of findings and might also weld the jigsaw-like fragments into something of a more coherent picture. As it was the starting point for all that followed in informational terms, clinical knowledge was addressed first.

Chapter 7, Fieldwork: The Clinical Domain, Clinical Knowledge and Data, the Process of Generation and Application Examined

This chapter contains the main report from the fieldwork in the clinical domain. It describes and discusses the data collected by interviews and observation. It also addresses its relationship to initial theories and grounded theories, which emerged as a result of this process.

The part of the report that addresses the non-clinical domains is contained in chapter 8. This presentational style is used because opportunities for access in the field research stage did not follow a neat pattern through key groups involved. Research began with some of the clinicians, but then moved around other groups, as individuals became available. However, it was necessary then to present the data collected and analysed in a logical format, e.g. by domain and key stakeholder group within those domains. Thus clinical and non-clinical areas provided a natural division around which to organise the presentation.

With regard to the detail of this chapter, it begins with exploration of the insights the data offered into the nature of clinical knowledge and data. The chapter moves on then to description and discussion of the observed application of clinical knowledge in patient care settings. This is in order to explore how knowledge is reaffirmed and developed, and to establish the basis for, and nature of, the contents of the medical casenote. The casenote itself is then explored and reviewed on the basis of author, purpose, intended user and, consequently, valid domain of use.

7.1 Clinical Knowledge and Data

The starting point for data collection here was the assertion, discussed in the literature review, that clinicians, no more than any other group or individual, did not have a direct

line to the 'truth'. Thus, the aim was not to judge the validity of their views on what knowledge might be firm and what might be tentative. However, clinicians were recognised as the genesis of the clinical data which flowed through the NHS and ultimately became statistical data sets. Their perceptions of clinical knowledge and the data they created, and the researcher's own perceptions were, therefore, of interest to this thesis, as they would enable a more informed critique of the coded datasets, and decisions which flowed from them. As noted earlier:

'The perceiver's world of reality, no matter how difficult to evaluate, must be the starting point for assessing the reliability of information' (Bruner et al, 1947: 69)

In addition, as research progressed it became likely that, while one domain was at issue, two different models of it existed.

In terms of how the clinician is initially socialised into the world of medicine, it was beyond the scope of this research to attend medical schools. The literature review was, therefore, relied upon in this regard, but only in so far as subsequent research with working clinicians supported findings there.

Interviews and observations were designed, therefore, to enable insight into the nature of clinical knowledge, and the nature of the data clinicians record in medical casenotes. The literature review had indicated some fundamental issues about the realm of clinical knowledge and information, particularly that uncertainty was a central fact about medical reasoning. Early responses in interviews confirmed this:

'Most (diseases) are pathognomically very difficult to diagnose definitively. There are some; for instance blood sugar above a certain level is pathognomic of diabetes mellitus, but these (instances) are rare.'

'There is an underlying scientific logic to medicine, but not to how it is practiced or recorded.'

'No definitions are taught in medicine, and neither are there any approved definitions documents.'

‘ clinicians are never taught terminology or describing and recording as accurately as possible.’

The practical outcome of this situation was experienced by the inventor of Read codes. Commenting on the issues he faced in trying to capture key elements of clinical terminology, he stated:

‘What I realised I could not overcome was the phenomena that clinicians, like everyone else, can often see the same thing and label it differently. So one clinician’s ‘asthma’ was another one’s ‘wheezy chest.’

Thus, the evidence supported the notion of uncertainty and subjective opinion being typical rather than exceptional in clinical work. This tended also to support suspicions of an irregular relationship between clinical data and its statistical counterpart.

Further investigation indicated, however, that such suspicions might be unfounded. During an interview with a senior statistician it seemed as though this situation was recognised and addressed by the developers and users of the classifications and their output:

‘ it would be difficult to store the full English or Latin name of every diagnosis and operation There is always the possibility that someone will substitute other words having the same meaning ... it would be virtually impossible to take account of all the descriptive variables that clinicians might use.’

However, closer questioning about how the problem was addressed indicated that earlier suspicions were justified:

‘This problem is solved by using a set of alphanumeric codes. Diagnosis is coded in ICD-10. These codes clearly use a lot less record space and are much easier to search for.’

This pragmatic solution patently addressed the issue of volume of data. It also ignored the essential value of the heterogeneity that is clinical terminology, or rather clinical

phenomena and their associated terminology. It also overlooked any problems inherent in shoehorning it into aggregate, static labels.

The existence of a problem was further confirmed when findings like those above were woven into later clinical interviews:

‘Read 3, which makes no claim to capture all possible clinical terms, contains between 200,000 and 300,000 terms. ICD-10 contains approximately 12,000 and OPCS-4 even fewer.’

‘In reality, when we look at Read 3 in use we find that users actually use relatively few terms in the main. However, that has to be seen in the context that, before we developed Read 3, we undertook a test, using ICD-10 and OPCS-4 to try to code the in-patient work of a geriatrician. It simply was not possible to accurately describe a significant amount of his work using those terms. So numbers of terms are only part of the problem. It was what they describe that is the real issue.’

Taking these findings to non-clinicians began to reflect the endemic conflict within which the key groups were operating. For instance, difficulty in establishing definitions for the classification of clinical phenomena was seen by managers as the result of clinicians being difficult. As one managerial participant put it:

‘Clinicians just can’t agree - if you get more than two together in a room you have no chance’

A second managerial participant stated:

‘They always throw just the exception to any definition at you, and often insist that everything is an exception. They do not have the will to sort definitional issues out.’

Thus underlying conflict was manifesting itself in clinical resistance to managerial involvement. What was also clear was that this approach rejected, or failed to recognise, the notion that an inherent problem existed in attempts to ‘define’ complex, often relatively poorly understood, natural phenomena. This lack of understanding, and

the organisational conflict which nurtured it, was evidenced by the remark from one NHS manager:

‘.... for instance if the clinical statement is ‘baby born well’, the DH is not interested. If it is ‘baby born sick’, the baby is defined as a patient and the DH is, therefore, interested, but only after 28 days.’

Thus, research confirmed a situation wherein the universe of discourse was imperfectly understood, and where cognitive perception, knowledge, and information, in terms of methods of describing observations and views of elements of it remained, even after the clinical training phase, subjective and heterogeneous to an unquantified degree in relation to the phenomena with which they dealt. This was not to say that there were no definitives, no absolutes, simply that no work was found which analysed types of clinical knowledge in such a way as to list or spell out which phenomena fell into which category and what the relative percentages were. Lack of this type of work by the non-clinical users of clinical data was thought to be a result of socially-held perceptions of clinical work as scientific and, therefore, precise, certain and objective. Further support for this assertion is discussed in chapter 8.

Thus two clear issues began to emerge at an early stage of analysis. Firstly, an underlying objectivist philosophy could be seen running into an inherently interpretive area of reality. In such a situation, if Schatzki’s observation that ‘the factors that determine meaning are the factors that determine understanding’ (Schatzki, 1983: 135) is correct, consensus or any sort of meeting of minds was not likely between groups so philosophically distanced and also so distanced by the roles into which they had been socialised. Secondly, this was an interesting context in which to reflect on Giddens’ (1976, 1984) work on Structuration Theory. Constant efforts at definition by one and resistance by the other could be interpreted as use and maintenance of interpretive schemes which individuals use to make sense of, and continually validate personal views of reality.

These findings led to the researcher's original perceptions of the 'Clinician as Scientist' being enhanced by consideration of the 'Clinician as Artist'. This emerged as the first major, higher level analytic category around which to organise observations and findings. It knitted together earlier themes of Modelling Reality, Models of Enquiry and Knowledge Gathering, and Culture and Knowledge as Truth, and in doing so provided a more coherent explanation of behaviour and issues observed.

This perception was deepened by further interviews and observations of clinicians, aimed at progressing insights into the nature of clinical work itself, and enhancing these by exploring the social context of the professional. In their responses each participant was at pains to stress how different clinicians are in terms of application of clinical knowledge and output from that process. The following statements were typical:

'My responses apply to me.'

'Clinicians are very different and their styles are very different.'

'Experience, etc. can vary dramatically.'

This was perceived as raising the possibility that levels of expert, individual discretion that characterise this profession were achieved by trading off the kind of global rigour expected from a 'scientific' endeavour. This perception was not dispelled when a clinical participant revealed:

'There is an underlying scientific logic to medicine but not to how it is practiced or recorded. All of this affects the objective value of information.'

Nor was it dispelled when a clinical participant described how a large amount of data is acquired during the consultation:

'.... through application of the *standard* medical approach: taking the history, which can include personal history, past history, family history, social history etc., examination, which can include inspection or observation, palpation, auscultation

and percussion. You then come to a provisional working plan, including tests of blood, urine, X rays, scans etc., and when that lot comes back you may come to a provisional 'diagnosis' and treatment schedule.'

Globally this could be considered a standardised approach, but it was worth reconsideration of the context within which this approach is used. It includes a lot of 'cans', indicating a level of discretion reflective of this profession.

Research then took exploration to a deeper level, in an attempt to get closer to the essence of knowledge gathering and application. As discussed by Kay and Purves (1996) and Kluge (1996) the personal consultation is:

'..... not an interpretationally neutral fact gathering exercise, because it involves something other than a neutral information transfer this entire process carries its own phenomenological burden ...the physician ... records ... information with an ineluctable phenomenological bias.' (Kluge, 1996: 88)

As discussed earlier, cognitive psychology (Bruner et al, 1947, Postman et al, 1948) supports the phenomenological view. Fieldwork with clinicians confirmed this:

'Classically the medical history a doctor takes is subjective from both the doctor's and patient's perspective and doctors are trained not to try to put an interpretation on that, in other words, not to put words into the patient's mouth, but to use the patient's words. However, in reality lots of doctors cannot help themselves.'

Consultation emerged, therefore, as highly standardised in terms of the broad procedures of history taking etc., but variable in terms of questions asked, responses acted upon and inferences drawn, as evidenced by the following clinical quote:

'The other day a colleague of mine reported feeling a hard liver edge in a patient. My own examination indicated this was not so.'

This was further confirmed by a Consultant after conducting a consultation. He confirmed that his qualified colleagues:

‘.... would be quite likely to go about the consultation differently and may even come to different conclusions, depending upon a number of factors, including the patient’s personal characteristics, the relationship established, the Consultant’s interests, experience, demeanor, etc.’

In order to gain further insight into this and earlier findings, a number of consultations were observed. The following extracts from the transcript of some of those consultations begin to demonstrate these points. They each begin with a transcript of the letter from the GP referring the patient for a consultation.

7.1.1 Patient A:

‘Dear Mr X

I should be grateful if you would see Mrs. A.

For several weeks she has complained of persistent pain in the lumbar areas with occasional dysuria. Urine cultures have often been negative but they show persistent pyuria greater than 1000 into 10 6 per litre. I should be grateful if you could look into her problem. A recent full blood count incidentally showed mild iron deficiency anaemia.

Yours Sincerely

Dr Z’

On discussion with a number of GPs and Consultants it became clear that the level and type of detail contained in this letter are not predictable. In other words, such sources are non-standard.

To an extent, although it was an entirely different case, this point was demonstrated a little later by a second case, Patient B (see page 171) whose GP went into great detail and included mention of her smoking habits and living arrangements.

To continue for the moment with Patient A, the receiving Consultant noted in the casenote all the clinical information *he* deemed relevant to *him* in undertaking this

consultation, which proceeded as follows:

‘-Hello Mrs. A. I see from your GP that you have a pain in your back.

-Yes, on my lower waistline, more to the back than the front.

-When did it start?

-About twelve months ago.

-Was it a gradual onset or was it sudden?

-Really it started when I was sterilised in 1995 and it was gradual from then.

-Has the pain got worse since then or has it stayed about the same?

-It varies. I have been taking Solpedol, about six a day, and obviously it's less after I've taken one.

-Do you mean Solpadeine - large soluble tablets?

-No, Solpedol.

-O.K. Do they help?

-Yes, but the pain is here now.

-Is it constant?

-Yes.

-Any blood in your urine at all?

-No,

-Have you taken any antibiotics in the last year?

-Yes.

-Did they make any difference to the pain?

-I don't think it was there then. I can't really remember.

-Is your weight steady?

-Yes.

-Is your appetite OK?

-Yes.'

The Consultant then proceeded with an examination of the patient while continuing to talk to her and explaining what was happening and why, following which the dialogue continued as follows:

- ‘-We know from our own and the GP’s urine checks that there are crystals in your water, which may account for the pain.
- My GP thinks it may be a kidney problem.’

The Consultant then explained how the kidney works and why, therefore, the GP may have thought it a kidney problem.

He then brought an ultrasound scanner in and scanned the patient’s lower abdomen, watching the monitor as he did so and ultimately printing the screen images for inclusion in the patient’s casenote folder. He then advised the patient:

‘-The kidney looks a bit distended and we need more information to tell us why. The most likely cause is a small stone blocking the tube from the kidney to the bladder. So, I’ll send you for an X-ray today and an IVP - that is an injection of dye to show how the kidney is working. The IVP will not be today, but it will be arranged as soon as is possible, because if it is what I think it is the kidney is being damaged by it so we need to sort it out.

-What is the cause?

-It is probably associated with diet, probably you are not drinking enough fluid.’

The patient then went off to the X ray Department. She returned a little later, and the consultation resumed. The Consultant showed her the X-ray, which showed a lot of stones in the kidney, and basically advised her that was the source of the pain. He also advised:

‘-We still want to know how well the kidney is working, so we will proceed with the IVP I mentioned earlier, but I am also going to arrange a renogram, which will measure function of the kidney more accurately. When all the information is back we will either remove the stones or the kidney if necessary. It depends on kidney function and also how difficult taking out all those large stones would be without removing the kidney. The problem is there is some infection associated with those stones as well - we have had a urine sample from you today - so I am going to prescribe some antibiotics through your GP. We’ll get the tests done as soon as possible.....’

7.1.2 Patient B

'Dear Mr X

I would be grateful if you would arrange to see this pleasant 86 year old lady in the Urology clinic.

In the 1940s, at St. X hospital, she had a hysterectomy, but shortly after this she developed a urinary fistula, which was utero-vaginal. The fistula's opening was near the left ureter about 1cm from the ureteric orifice and an excretion urogram showed extensive hydronephrosis and poor function of the left kidney with a normal right kidney. She therefore underwent a left nephrectomy. She has had no further problems with her kidney but in May this year an MSU showed an increase in RBCs but no significant growth. Subsequent urinalysis was negative and she has no urinary symptoms. However, in view of the fact that she has only one remaining kidney I would be grateful if you would advise on further investigation and management of this microscopic haematuria. Abdominal examination is unremarkable. Past history includes myocardial infarction in 1990 which was treated at home, she is also hypertensive on treatment and recently started Simvastatin for hypocholesterolaemia. She was investigated in the 1970s by the neurologists at St. X for blackouts, which were felt to be some form of transient ischaemia. She also has a history of candida infection of the tongue and is known to have degenerative disease of the lumbar spine.

She lives alone and is independent. She continues to smoke cigarettes.

Yours Sincerely

Dr Y'

The consultation began with the usual greetings etc., and used the GP referral letter as the basis for discussion:

'-So, you have had a hysterectomy?

-Yes, and they cut my ureter by accident.

-And you have had your left kidney removed?

-Yes.

-And you know that the reason you are here today is that your GP has checked your urine and found a trace of blood in it and he is concerned because you only have one kidney?

-Yes.

-Do you have any difficulty passing urine?

-No.

-Is there any blood when you pass urine?

-No.

-Do you have any pain when you pass urine?

-No.

-How frequently do you pass water?

-I take Frusemide, so I go more often after I have taken that, and I am slightly incontinent.

-But basically you are passing water normally for you?

-Yes, but I do have some pain in my back.

-Where?

-In my lower back, here, and I cannot walk far without getting that pain.

-Do you have any pain down your legs?

-No, but it is in my back after walking short distances.

-Do you have any pain in your calves?

-Yes.

-Do you smoke?

-Yes.

-How many?

-Do I have to be honest?

-Yes.

-Twenty a day - at my age, indulge me.

-Well, we have checked your urine again here today and there is some blood in it, but that does not necessarily indicate problems. But today I also want to scan your kidney and check your bladder with a small telescope. It is very easy to do, does not hurt and can be done under local anaesthetic. If all that shows normal we will know today that everything is OK. OK? The most likely cause of the trace of

blood is a slight infection so we have sent a sample off to check it. Which kidney did you lose?

-This one.

-OK. Stay quite still.'

The Consultant then scanned the patient's abdomen, watching the monitor and explaining what he was seeing as he did so:

'-That looks like a perfectly normal kidney to me, slightly large as you would expect, because it is compensating for the one that was removed.'

He then printed the image from the scanner and gave the patient a leaflet on flexible cystoscopy, which was the procedure he was about to perform on her bladder, to read while she waited for it to be done. The cystoscopy was then performed and revealed a small transitional carcinoma, which was biopsied, there and then, and diagnosed as 'very early' and 'benign'. The patient was advised of this and the treatment planned. Using his consultation notes, the Consultant dictated a letter to the patient's GP.

The above transcripts describe the work of two Consultants. They confirmed that the process of applying clinical knowledge was standardised to the extent of the processes described above, i.e. history taking, examination, etc. What the researcher was then interested in was whether inferences drawn from these processes could differ between clinicians. Findings in this respect would help either support or refute the notion that clinical knowledge is affected by the personal and professional characteristics of individual clinicians. They might also add a commentary to the notion of the Clinician as Artist.

This evidence was acquired during the hospital observations, when the researcher was lucky enough not only to observe experienced consultants at work in consultations, but also to be present when trainee doctors worked in the clinic as a means of pre-examination preparation. In this situation, both the trainee and the Consultant attended the same patients. The trainee undertook the first consultation, and was followed by the

Consultant, who repeated the consultation. It was not possible to be present in the room during these consultations because there was already a consultant, a trainee and a patient in a small consultation room. Patient privacy was also an issue. It was, however, possible to observe the Consultant questioning the junior as to findings and opinions after each consultation.

Invariably the trainees displayed uncertainty, most obviously due to lack of confidence. Their opinions also showed inaccuracies, due to incomplete knowledge and experience. This not only manifested itself in their findings, but also in how they arrived at them (questions, weightings, associations, etc.) and how they expressed them. As one Consultant remarked:

‘For instance, a junior would say ‘anterior myocardial infarction, a senior might say ‘anterior septal myocardial infarction.’

Interestingly, the reverse could also be true, but as a result of ‘professional’ and not purely clinical reasons. As one clinician explained:

‘Seniors can record less, both because of their level of expertise and because, culturally, it is a symbol of seniority.’

The effects of the social arrangements surrounding the profession were once again, therefore, evident.

Discussion was then taken back to exploring the underlying knowledge which had been observed in action. As described by a clinical participant:

‘The clinician starts with two main groups of knowledge, prefaced by locational knowledge the setting confers some knowledge, i.e. if I know the patient will be in Outpatients I immediately assume they cannot be too sick. If I am scheduled to see them at home I assume they may be quite ill, or they would have been scheduled to attend Outpatients.’

That type of knowledge can be seen to nest within the two main groups which he went on to describe as:

‘.... general knowledge and experience, which can apply to all patients, and consisting of formal knowledge: that which has been taught to me, and informal knowledge: that which has been gained through experience, (and) specific knowledge about each individual patient, gained from personal consultation and communications’

As another clinical participant remarked:

‘.... the basis of clinical medicine is an amalgam of others’ knowledge and personal experience.’

Thus the knowledge clinicians bring to each consultation was seen to be variable in quantity, quality and nature, and its application, within the broad, standard framework of actions, was seen to be equally variable. What also emerged, particularly when read in conjunction with the other consultation transcript, (see Appendix 3, where the patient was a five year old boy) was the highly variable nature of patients’ concerns, self-knowledge, responses and ability to respond.

The next stage in the process of knowledge generation and application was described, again by a clinical participant, as follows:

‘Following the initial discussion with the patient I take the data collected and put it to my personal knowledge base and conclude a number of things about the present state of the individual But what I conclude may be very different from what another clinician, faced with the same data might conclude’

The discussion then explored the nature of the differences discussed, particularly in terms of quantitative and qualitative data. The researcher had a growing belief that at least some clinical data was highly subjective. What was unknown was which. Explorations here focused, therefore, on the extent to which quantitative data (in other words the sort that statisticians feel they can rely on) was objective. Responses

indicated that this view of quantitative data was simplistic. As discussed by a clinician turned systems developer:

‘.... for instance this happens in measurement of blood pressure, which relies on hearing as well as sight and measurement. The same is true for any quasi-objective measure. Only physically measurable objects are not subject to this, for example, specific enzyme levels.’

In other words, taking blood pressure depended upon myriad human attributes. The social element of ‘scientific knowledge’ was neatly demonstrated here.

Discussion then returned to the process of applying clinical knowledge. The above-mentioned process of ‘history taking’ was then described as:

‘.... interwoven by planning actions to confirm, improve, maintain, or disprove various clinical states, and postulation of some future states: goals for the patient or a prognosis.’

In exploring the conclusions which underpin this process, further evidence emerged of the uncertainty that is inherent in the nature of clinical work. Even the most senior consultants observed and interviewed made it clear that:

‘.... some (conclusions) are firm, some are tentative some (knowledge) is subjective, some objective’

and:

‘Conclusions, including written ones, are usually tentative i.e., ‘found lying on the floor- ?’, ‘fracture leg of femur ?’, ‘cerebral hemorrhage?’.’

The question mark here was routinely used in written casenotes to denote these were options the clinician was considering, one, many, or none of which might turn out to be relevant. As another clinical participant remarked:

‘Often the clinician never has a clue why the patient is on the floor and often they never find out.’

Even where apparent certainty existed, for example, where death was recorded as due to a heart attack, anecdotal clinical evidence suggested otherwise. As one clinical participant suggested:

‘.... it is not unusual for a post-mortem to reveal a perfectly healthy heart.’

What became clear was that, as shown above, although the physical approach was standardised the intellectual one was not, and neither was the patient’s ability to articulate on their condition. Many ‘social’ factors were operational and these affected the type and amount of knowledge elicited. These factors were discussed in the literature review, particularly in relation to work undertaken by De Dombal (1996) and, during the research, were confirmed as including experience, clinical acumen, confidence, culture, and specialty. Thus, the clinician is trained to act independently and confidently on the basis of the information available or acquirable, even where certainty is not possible. Resulting clinical findings and the totality of those findings were shown as sometimes remaining tentative, subjective and heterogeneous to an unquantified degree. Initial hypotheses that healthcare data was not what it appeared to be were, therefore, strengthened.

Also strengthened were hypotheses regarding social influences as potential causes of this situation. The analytic category ‘The Clinician as Scientist, The Clinician as Artist’ was now nested, therefore, within a larger concept of ‘Socially Constructed Realities’. The latter category followed reflection on observed behaviour in clinical work. This reflected observed adherence to socially constructed notions of what constitutes illness and what constitutes appropriate actions, including exercise of individual discretion. It also included consideration of issues like the fact that, until little more than ten years ago, AIDS was not recognised as existing. As discussed earlier, ‘an item plays no role that is not understood by someone.’ (Schatzki, 1983: 135)

and no action is taken specifically towards it. As one clinical participant observed:

‘Certain countries do not recognise as schizophrenia what we in the UK do
Ideas of what constitutes a suicide vary’

In terms of the research, prior to adoption of this perspective towards clinical work and knowledge, it was felt initially that clinicians, like scientists and other social groups, did not hold a direct line to the truth. However, clinicians were known to be the most direct investigators of that reality. On this basis their version of it was perceived to be inherently purer and generally more valid than that of other groups in respect of the same phenomena, particularly, for instance, statisticians. Research clearly indicated, however, that socially-defined norms underpinned both. What then became interesting was the objectivisation of clinical knowledge which followed. This is dealt with in later chapters.

Thus the picture of uncertainty could be enlarged upon by considering the basic universe of discourse, which observations indicated was considered by clinicians to be, in parts at least, relatively poorly structured. It might, however, be more accurate to assert, given for instance the AIDS issue, that it was current understanding of it which remained poorly structured. Further insight was gained, as shown, through consideration of clinical training, which added to initial perceptions of elements of heterogeneity in knowledge acquisition and application, based on human nature, judgement and experience.

This picture was then set against a key final output from this process, DH statistics about healthcare. As discussed earlier, in order to be reliable statistics must be based on quantitative, objective data. While it is arguable that ‘objectivity’ is a subjective concept, the extent of subjectivity the research found in the clinical domain immediately reinforced concerns about the validity of healthcare statistics. It also reinforced concerns about general assumptions surrounding ability to transfer such knowledge, without disturbing meaning, across social boundaries, particularly through

the medium of the medical casenote. That the knowledge was adequate to clinical practice was not at issue here. As discussed, the nature of the profession means that true transfer of knowledge between professionals is by no means a prerequisite for practice, beyond the clinical training environment. This point is important here however, because for the clinician transferability, particularly outside the clinical sphere, was not a primary factor in clinical knowledge use and development, and hence in recording practices when it came to the casenote. As one geriatrician advised:

‘I always have a belief there will be other carers, which is the main reason why I am comprehensive (in recording clinical information in the casenote).’

He recognised, however, that he was not representative of the profession in this. He did not consider use outside the clinical sphere. As one of his colleagues, from another specialty area stated:

‘I get the casenotes but I usually rely just on the GP’s letter and my own assessment of the situation.’

When asked why, he advised:

‘Casenotes are such an unknown quantity in terms of quality and even whether or not you always get them.’

Further exploration in this area yielded the following key insight:

‘Most clinical conclusions are tentative doctors are forced, for the classifications, to put morbidity labels on patients, which they dislike doing. This issue probably causes most trouble with clinical coding. ICD data could, therefore, be said to be ‘fabricated’ at this point.’

This found support in the literature:

‘There is no guarantee that local vocabularies for identifying reality coincide with administrative nomenclatures, except in the rare cases where regulatory language is put to use by employees themselves. There is, therefore, a tension between the

attention that doctors give to the local universe and the standardized administrative definition of pertinent objects for judgement.' (Dodier, 1990: 205)

The importance of this issue was emphasised by reconsideration of the casenote itself. As stated earlier, the medical casenote is the main source of clinical information for the rest of the organisation, up to and including the DH and its customers.

7.2 Clinical Data, The Medical Casenote

Review of this document was helped by work by Barzun and Graff (1977) and Krippendorff (1980) on the critical analysis of documents. This holds as a main aim assessment of whether fact or bias is the main characteristic of a document. It includes consideration of such factors as who produced the document, what its purpose was, whether the author aimed to inform, remind or have some other effect on the reader, and whether it is complete. It includes whether the document has been altered or edited, and whether the terms used are understandable by its readers. It also focuses on what the author's social and professional background is, whether the author was experienced, whether they observed what was described and, if so, to what extent the author was an expert on what was being witnessed. It also considers whether the author reported events truthfully, or distorted them, and how long after the event the author composed the document. Evaluation of these factors is designed to help with selection and evaluation of evidence, primarily in the field of historical investigation. However, it was also a useful framework to draw upon in analysing the medical casenote.

Interview data indicated that the nature of the contents of the casenote was extremely heterogeneous, simply when viewed in terms of the paradigm, professional training and individual variations which generated them. A physical review of several hundred casenotes confirmed these findings and revealed these documents to be highly personalised to each individual clinical author. They lacked an agreed structure, so not only was what was recorded variable, how and where it was recorded was also variable. They also tended to be hand-written, adding the issue of legibility to the other factors

which characterise them. They were, however, a clinical 'tool of the trade' and they were considered by clinicians to be adequate to the clinical job they perform.

From the managerial perspective, this document was the only primary source of information on the clinical details of patients encountering the NHS. Prior to this research the author had not found written evidence of the precise purpose with which managers endowed this document, or the assumptions they made about its contents.

Returning to the above-mentioned framework, the factors listed were explored in a series of interviews. The clinical view of the purpose of the casenote was described by a clinician as follows:

'The purpose of the casenote is to be a contemporaneous medical record of the features of the consultation It is a tool of the trade. I do not even think about it when I am doing it, it is so much a part simply of the practice of medicine We are taught that creating these is a sign of good medical practice.'

This conformed to statements in the BMA handbook of practice (British Medical Association, 1998). These assertions were important, not least because subsequent observations seemed to indicate that clinical assumptions about the possible uses and users of this document defined the nature of the information they contain. The booklet itself gave no insight into who the record was for: other clinicians, administrative managers, patients, etc. Nor did it define the word 'features'. Considerable latitude existed, therefore, and observation and discussion revealed the practical outcome of this to be a highly personalised document, the parts of which were often structured solely to the needs of its clinical authors, who may be many. As one clinical participant observed:

'When you are writing the record you are writing it for yourself. You never think of anyone else. You are looking after that patient and what *you* write has to do with *your* care.'

This helped to make sense of key characteristics of the medical casenote, as described

by another clinical participant:

‘There are no rules in clinical recording, we are not taught any there is a degree of disarray, there are no set educational patterns for recording.’

This was manifested by the lack of any standard structure and by the content of the medical casenote. Clinicians were found to be at liberty, as discussed in earlier work by the researcher (Drennan, 1994) to record as they will, what they will, providing they felt it represented a contemporaneous record of the ‘features’ of consultation, as defined by and for them. As another participant went on to say:

‘It is about a recorder and a patient as an individual.’

In other words, it need not be about fulfilling the requirements of the DH, or anyone else, for clinical information:

‘..... The primary thing in my head when I am writing the record is a blind following of clinical practice, in other words, habit. Also I know my patients will return and what I have written down gives me the necessary picture to keep checking back to. It is *my* baseline status for monitoring.’

In terms of the remaining characteristics of the medical casenote contents, a Consultant Geriatrician then confirmed the assertions of De Dombal (1996) and findings from the researcher’s observations:

‘The extent and selection of recorded material depends upon a number of factors. These include self-perception: juniors are expected, and know they are expected, to record everything. Seniors have discretion, which some exercise, to record less, down to a few sentences. Some are comprehensive and use the casenote as a template for the next reader, some do not.’

As another clinical participant explained:

‘.... In General Medicine the patient, not the wound is dealt with, in other words, the whole of the patient, not the hole in the patient. In surgery the wound is dealt with. The more subspecialty the work, the more focused and detailed and deep the record becomes.’

Further insights on this issue were provided by a Consultant surgeon, who confirmed the comment of another clinician quoted above. He commented:

‘Usually I am the treating clinician for my patients. If I need a colleague from another specialty to take a look I’ll probably have a word with him. The (case) notes don’t usually come into it, apart from the fact that I will probably make a note in them that I have asked for an opinion from a colleague. In fact, when I see a patient for the first time, I rely most heavily on my own consultation in terms of understanding what the problem is and any associated conditions. I note key aspects of my consultation in the notes, for myself, but other than that I don’t really use them.’

Discussions with GPs did nothing to challenge this assertion, with the following response being typical:

‘Often in reality a doctor will decide what is wrong with a patient by looking at them coming in and he will often tend to write what supports that. For instance, for what he thinks is a case of ‘nerves’ he will want to write down a few key questions that exclude pathological illness.’

This demonstrated a focus in recording data which involved justifying his actions for possible defensive use at some later date.

Variety and a focus on the idiosyncratic needs of the professional continued to be found throughout interviews and observations:

‘I record most of the history, planned actions are likely to be recorded, as are current states. Possible or planned future states are not likely to be recorded.’

‘The patient’s view of what is wrong with them is rarely recorded or taken account of, apart from as a spur to action towards certain actions and not others.’

The issue of assumptions about potential users and uses of casenote information, mentioned above, became increasingly important given this situation. Both these clinicians and other evidence collected suggested that the entries many clinicians made in the casenote were assumed to be for them. Consequently no consideration was given to the requirements of others in terms of contents, structure, understanding of language

used or legibility. When asked his opinion of the way in which the DH uses the contents of casenotes in order to produce statistics about conditions and treatment for NHS patients, a clinician reconfirmed earlier discussion of 'fabricated' data:

'That is just pointless, that information simply is not there usually. OK, possibly it is more there for treatments, but conditions, no. Nobody believes those things (healthcare statistics) anyway. Does anyone seriously use them? We certainly don't. They have no relevance to clinical practice. I'm not sure what relevance they can really have to anything.'

Apart from confirming concerns about the casenote as a source for DH clinical data, this also began to hint at the possibility that some clinical data: that which is treatment-related, was more valid for statistical classification purposes. This was explored further with a clinical participant who, in the course of a piece of research, tried to code his work using the ICD classification. He claimed:

'The assumptions built into the classifications about the clinical world are not borne out in real life for instance, there is no concept of 'absence of'. I might see a patient with a swollen calf and postulate a deep vein thrombosis. On examination I find that there is no deep vein thrombosis. ICD does not allow me to record all that'

This clinical heterogeneity, or rather the assumptions and social norms which underpin it, affected not simply what was written, but also how, as demonstrated by the following copy extract from a casenote history sheet prepared by a Consultant during observation of a consultation. The notes he made in the casenote (note the use of the query symbol '?' which, as mentioned earlier, indicated that the clinician considered this a possibility) were in barely legible handwriting. There may, therefore, be errors in this transcription and, in fact, it appears from a clinical reviewer of this document that 'Urine PR +++ does not make sense:

'Wt. 50kg BP 120/80
Urine PR+++
BL+++
LEUC+++
-pain varies

-Solpydol taken for pain - helps pain
-has pain at present
-no other symptoms
Loin pain _L
Started 12/12 global onset

weight steady
no discharge
periods regular
bowels OK
U/s - L kidney
?stone
-IVP – urgent'

A diagram was also sketched to demonstrate the location of the stones.

Thus it became clear that the information was also highly subjective in terms of arrangement. This sample note also demonstrated the dimension of language through the use of 'clinical shorthand'. As one clinician explained, discussing an instance in his own and colleagues' practice:

'The clinicians thought 'diabetes', the manual record said 'diabetes', the system contained 'diabetes'. Each clinician knew that (of all the possible types) he meant 'diabetes mellitus'.'

Given comments above about the perceived uses and users of this information, this was not surprising. This is not to say that no dissatisfaction was expressed by clinicians about this issue. A Consultant physician maintained:

'The issue of the content and structure of the medical record is one we must sort out. We really must agree standards. Work has been going on unsuccessfully in this area for years.'

Interestingly his concern came from a desire to achieve computerised patient records. The concept of a fundamental clash of philosophical extremes, not least in terms of technology and subjective knowledge, was however relevant here. It was also one

which, during earlier observations of clinical systems working groups, the researcher found no evidence of clinicians addressing or being aware of.

The issue of presentation of information, in terms of structure, or arrangement, had an additional aspect. As a clinical participant explained:

‘Clinicians hold the concept of clinical freedom dear. Therefore, structuring the record may be considered an assault on that freedom being a professional in medicine you are not answerable to your boss but to the professional body. The more you structure the data and put it into the market place the more you come under the control of the hospital boss.’

This was not, therefore, simply an issue of language being used to protect professional independence by achieving social closure. Content and structure of this key document were being used in the same way. The notion of clinical resistance to managerial involvement mentioned earlier therefore found support here and gave some insight to the notion that both cultural and structural issues were influential in informational terms.

The issue of language was further elaborated upon by a researcher working on development of HRGs, when describing a database of clinical data he was discussing with a clinical group. On the basis of what Consultant psychiatrists wrote in casenotes, 80% of patient episodes were being coded by the treating clinician in the ICD classification to categories intended for patients with mental conditions unspecified as to their nature or aetiology. As the HRG researcher observed:

‘The doctors, it turned out, had meant ‘senile dementia’ (a much more specific condition) but they did not write that.’

Common understanding was assumed to prevail amongst clinicians within the context of the patient, the casenote and the clinical community. Users and uses of the information were clearly being assumed to reside within that community also.

This kind of use of a tribal language happened and worked successfully and demonstrated, as described by Mervin Pollner (1987) that when we are discussing and describing features of our world with others: what we saw, what we did, what happened, we make a fundamental assumption; that we all have at least potential access to the same underlying reality. This is, of course, one of the basic assumptions of empiricism, that any neutral, competent observer, placed in the same position, would see the same thing. It is not the intention to argue either for or against that philosophical commitment here, although this arguably simplistic assumption might be a reasonable consideration when trying to explain the approach of the DH to clinical data. However, it was equally possible that the fundamental philosophical characteristics of the clinical domain do not, in practice, take the assumption that far. Rather, they may simply assume the same, or a sufficiently similar, underlying reality amongst the group into which clinicians have been strongly socialised, and make no assumptions thereafter. This notion found further support when consideration was given to the fact that a number of clinical participants did not know that the casenotes were used for derivation of classified data. As one clinician put it:

‘In between consultations the casenotes go somewhere. I’m not really interested where so long as they are back when I need them for consultation. I don’t know what, if anything, happens to them in the meantime.’

When advised that national healthcare statistics came directly from them he was astonished and replied:

‘But how? That information isn’t even in them is it?’

Thus no assumption of use outside the clinical context was often considered, and those within that context had been suitably equipped to operate the casenote system. To refer once again to Schatzki (1983) people gain understanding by being trained into a form of life. This helped to explain why The BMA Handbook (British Medical Association, 1998) referred to above did not define the ‘features’ of the case which must be

recorded in the medical casenote. The evidence suggested there was an assumption that they flowed naturally and differently from the process of care in each unique case, and that they must be allowed to emerge in this way if the individualistic demands of care situations, and clinical professionals were not to be impeded. Again, this was also reflective of an assumption that the only users of the casenotes were clinicians.

Thus, to the uncertainties discussed earlier, which included the nature of the universe of discourse, and the diversity of knowledge acquisition and application, could now be added highly personalised medical documents focused solely on what each clinician felt, at any given point in time, was the necessary contribution to the care of their patients. These might be firm conclusions, but were apparently more often tentative working hypotheses. The clinician entered only that data he perceived as relevant, relevance being a product of his conceptual framework, which was focused at keeping patients alive and well. He entered it in tribal terms, not always accurately decipherable or translatable outside the clinical sphere. Also, as mentioned earlier and also described by another clinical participant, the clinician may:

‘.... undertake actions to exclude possibilities, so tests, etc. that are recorded usually indicate absence of something not presence of something.’

As another clinical participant remarked:

‘The fact that I have ordered a barium meal can mean I am trying to exclude the possibility of bowel disease, and I might write in the case note ‘?bowel disease, ?kidney stones, pyelogram’.’

Casenotes emerged, therefore, as a minefield for any non-clinical user. This statement was important when consideration was given to the actions of coders, which are described in chapter 8.

All of these findings contributed to further development of the initial category of ‘The Clinician as Scientist, The Clinician as Artist’ to include ‘The Clinician as

Professional'. This addition reflected observance of the highly specialised, sometimes defensive use of tribal language. It also reflected awareness that actions in these respects were very much characterised and enabled by membership of a powerful profession. This set communications standards, endowed members with 'scientific status' and, within the broad definition of the practice of medicine, encouraged and necessitated behavioural independence and discretion. It also, as mentioned above, could be argued to endorse and sustain a trade-off of rigour, in terms of practice on a global scale, for the sake of the kind of individualistic arrangement which helps sustain the position of the profession socially. The more flexibility a system incorporates, the less control is possible, particularly by outsiders. However, it is also arguable that what could be perceived as a lack of rigour could also be perceived as entirely consistent with the nature of understanding of the associated universe of discourse. That perception stimulates notions of a rigour and orderliness which were ultimately shown to be partly a result of the image the clinical profession conveys to the outside world, but which are also imposed by Government behaviour and which, being imposed, must be considered artificial. This is not to say that all social constructions of reality are not, to some degree 'artificial'. They must be in that they are constructs. The degree of artificiality was what was of importance here, particularly as the DH clinical 'models' at issue were shown to be based on indirect investigation of that reality. In other words they were constructs fabricated out of the data selections made by another, distinct and very different social group, arranged according to a blueprint upheld by the DH. An analogy might arguably be a house which is built in India, knocked down and reassembled without knowledge of the original plans in Iceland. It is only marginally possible that the model which would result would be a house at all, and if it did it would most probably resemble an igloo.

To return to the phenomena of the linguistic aspects of these socially-defined norms, this also had relevance to discussions about the transfer, or what came to be seen as lack of transfer of clinical information through various organisational settings and groups. In the above example the Consultant was querying whether the patient had

kidney stones, which in the event she had. However, a doctor would know these are not necessarily the cause of the pain. As one clinician remarked:

‘Many people have kidney stones with no pain at all.’

As discussed further below, when presented with this casenote, a number of clinical coders immediately decided that, using ICD-10, they would record kidney stones on the patient’s computerised clinical record as the main reason for treatment. Not being clinically trained, this was the only thing they could decipher from the above. As mentioned earlier, and drawing again on the work of Bruner et al (1947) and Postman et al (1948) in the field of Cognitive Psychology, words of a high value to a perceiver are rarely rejected in the face of meager information. People see what they wish to see, perception is guided by inner cognitive sets that reflect past learning experiences, and by values, motives, basic personality needs and self-confidence to act effectively in a given situation. A coder’s cognitive sets are framed by knowledge, not of clinical work, but of the contents of the classifications and by what might be described as more ‘common-sense’ knowledge which fastens on the familiar. It was likely, therefore, if cognitive psychology is correct, that coders would fasten on terms in the casenote which were familiar from the classifications. How consistent this was with the clinical ‘reality’ of the patient consultation it records is discussed further in the next chapter. For the moment it is important to recognise that, where this happened, transmission of data occurred, something was sent and something was received. True ‘transfer’ did not occur, because change of meaning intervened.

In exploring this issue further it is necessary to describe the context, in terms of other people and systems, within which this as yet ‘clinical’ knowledge began what is often described as its ‘transfer’ around the organisation, although, as discussed above, and as later research showed, ‘transformation’, not transfer would be a more appropriate notion.

Chapter 8, Fieldwork Continued: Beyond the Clinical Domain

This chapter contains the remainder of the fieldwork report and focuses on the non-clinical domain. Once again, it describes and discusses the data collected by interviews and observation. It also addresses its relationship to initial theories and the grounded theories which emerged as a result of this process. It is structured around key analytical categories which emerged as an inductive product of data analysis.

The chapter begins by discussing the process of coding clinical entities from medical casenotes to classifications. This is the point at which clinical data is extracted from the clinical domain. The discussion includes consideration of both people and systems. The chapter also explores the relationship of managers, Ministers and statisticians to these data and processes.

8.1 Coding Clinical Information

Coders are part of the non-clinical staff of hospitals. Their job is to abstract information from medical casenotes which describes patients' complaints, problems, diagnoses, treatments or other reasons for seeking medical attention. Like managers, their loyalties and behaviour are broadly towards organisational objectives and norms. They are taught and, as will be demonstrated below, their behaviour indicated they believed, that the information they required was, or should be in the casenote. When focusing on this in interviews numerous responses consistent with the following emerged:

'If only doctors would write down everything they were supposed to and write it legibly and if only we were properly staffed and had more medical training we could really make a difference and improve things

This kind of statement reflected an underlying belief that all of the clinical information required by the Government and the classifications emerged, in some form, within the process of clinical consultation and treatment, and could be recorded in the medical casenote. If this was not so, coders had no way of executing their organisational role and Government had no way of demonstrating public accountability. Whole careers rested, therefore, on perpetuating this approach.

Armed with this belief, coders went about trying to abstract, code and record the required information by applying the above-mentioned classifications, ICD-10 and OPCS-4, to the best of their non-clinical ability. Their aim was to produce consistent and comparable sets of clinical data. In this sense coders, like the classifications, were Government-defined instruments of social enquiry.

The aim of consistent data stumbled at the first hurdle. Clinical classifications are not unproblematic instruments for non-clinical users. However, their application is not always taught. The official basis of coding training is 'The NHS Executive Clinical Coding Instruction Manual' (DH, 1994). This instructs that:

'All codes assigned must represent an accurate translation of the diagnostic statements or terminology as used by the clinician.' (DH, 1994: 1)

Accuracy is stated as resting upon adherence to the principles and rules of ICD-10 and OPCS-4, on development of coding skills through training and experience, and on a basic understanding of medical terminology. However, coders are not clinically trained. Most receive, as one coding manager described:

'.... the most basic level of training in human anatomy, physiology and medical terminology.'

As admitted by one of their training groups, they also have:

'.... inadequate training in the content, structure and rules of application of the classifications.'

This was confirmed by a number of coders interviewed, and summed up by one:

'I was supposed to go on a training course but we were too short-staffed so a colleague showed me what to do.'

Given this situation, it was not considered surprising that, as mentioned above, assumptions about the existence of the required information in the casenote were not challenged.

In addition, analysis of the dataset that is the output of this process was generally performed independently of reference back to clinicians and casenotes, and by

individuals not involved in its coding. Knowledge of rules for structuring and defining the data elements were, therefore, the only ways in which users could understand its contents. End-user understanding of the meaning of such data was, therefore, limited. It could have been helped by knowledge of the ways in which the classifications operate, in term of rules and definitions, but this would not address the effects of the variability of coding skills, clinical statements, etc.

Further exploration of the coding process continued to reveal insights of interest. These included the fact that, while definition of some clinical concepts was patchy, definition of the clinical fields on the coded record also remained nebulous at best. This was explored with a senior manager at HES:

‘Different coders seem to have different opinions There is a definition for ‘Primary Diagnosis’ but that is ‘main condition treated’ and that is very ambiguous. One coder might code kidney failure as the main reason for being treated, another might code the underlying disease, which could be, for instance, multiple myeloma which caused kidney failure, as the main reason.’

This finding was supported by unpublished work undertaken by the researcher (Sutton, 1994) within the NHS Executive, which showed that at least six different definitions were in operation in 1994. Thus, when a patient was admitted with a heart attack, one coder would code the heart attack into the first position on the record. Another would code congestive heart disease, another would code collapse, because that was all that was known when the patient was admitted. The same situation applied to surgical procedures. As a HES manager advised:

‘Some say the most resource intensive (should be coded first) some the first (procedure) chronologically, and there are probably others.’

The importance of this rests in the fact that the conditions or treatment coded in the first field of each computerised record are those which make up the bulk of Government healthcare statistics regarding the activity of NHS hospitals in these areas. The technical biases or limitations of the systems, and personal limitations and biases of individuals, are largely at issue here, but again, socially-based perceptions of systems’ yields masked the implications.

With the background described above, and the researcher's considerable professional experience of hundreds of coders, dozens of coding departments, and the main coding models and methods, three hospital coding departments were visited to specifically focus on the coders' worldviews, and on their views of the casenote contents and their relationship to them. Also sought were insights into the effects of these factors on the clinical data.

There could be no greater extreme of difference in the NHS than that between the world of the clinician and that of the coder. Coders complained bitterly, and the researcher's experience supported this, that they were understaffed, underpaid, undertrained, underequipped and undervalued. In terms of their place in the organisational picture, their salary scale and organisational classification indicated that they were classed as low-skilled administrative staff. They ranked among the lowest paid of all healthcare personnel groups. One of the departments in question had three full-time coders, two part-time staff, and some call-out staff, and faced a throughput of in excess of 100,000 cases per annum, which was not atypical. In addition, as mentioned earlier, coders were not clinically trained. Not surprisingly huge backlogs of work piled up. Where fundholding applied, the hospital was only paid for work done when it raised an invoice based on the clinical coding of a case. One coder voiced the comments of many:

'All of this leads to us taking short-cuts with the work, like coding fewer items from each casenote than we feel we should, or coding to a lower level of detail than we have been trained to, given the level of detail in some of the casenotes.'

This was confirmed by a coding department manager from another hospital:

'Our backlog was so great that all gynaecological cases were coded as 'well baby'. That way we got up to date and got HES off our backs.'

These kinds of observation were at the foundation of the major conceptual analytical category of 'The Social Rationalist'.

In order to gain first-hand insight into the practical implications of this, coders at a number of sites were observed coding clinical casenotes. A typical example of one of these exercises is described below.

8.1.1 The Coding Process

Most coding was done using the medical casenote as the source document. Some was done using a proforma created from the clinical encounter by either the clinician or a medical secretary. Medical casenotes were collected daily from the hospital wards. Without a nationally used format for the contents or structure of these documents, what the coder received varied enormously in terms of order of contents, level and type of clinical detail recorded by the clinician, and details of content. Some contained the results of investigations, some did not. Some contained the case history, compiled by the clinician during the consultation and described above, some did not. Legibility also varied greatly. All casenotes were hand written by the clinician and those seen by the researcher varied from the legible, to the legible but incomprehensible, to the illegible. Regardless of these factors the coder's job was to assign clinical codes from either ICD-10 or OPCS-4, or both, for each casenote presented. Whether or not they were all presented seemed to be a matter of trust as no actual systems were in place to cross-check numbers of patients registered as admitted with the numbers of cases coded. This was only checked retrospectively on the production of statutory returns. Any discrepancies were dealt with by changing the numbers on the cross-referenced returns, at either hospital or DH level, rather than searching for and coding missing cases.

Coding of a large number of casenotes was observed. The following is a typical example.

8.1.1.a Patient A:

This patient had been seen in a colposcopy clinic and the notes had come to the coder directly from the clinic.

The coder accessed her PAS system, entered the patient identification number, as written on the casenote, and checked that the name and address on the screen matched those in the casenote in front of her. Apart from demographic details and administrative hospital details, for instance 'Consultant', 'specialty' and 'hospital ward', the screen also held fields for primary diagnosis, subsidiary diagnosis and

secondary diagnoses, numbered 1 to 5. It also provided a field for date of primary diagnosis. This last field was not universally present across the NHS and this was one reason why statutory NHS data could not be used by epidemiologists and researchers to study prevalence of disease, even though official Government documentation indicated otherwise.

The coder perused the doctor's hand written casenote sheet to find out why the patient had come in this time, and to pick up anything else *she* considered relevant to their treatment or management. She stated:

'I can't read the Consultant's handwriting so I'll have to see what else might tell me. The GP referral letter indicates an abnormal smear. The Consultant will have done investigative tests to work out the cause of the abnormality, but the histology report has not yet been inserted into the case note. I've got no choice now but to code it as 'abnormal smear', even though I know more specific information has been gained by the hospital at some point during the patient's visit.'

She looked up the diagnosis in the index to the ICD-10 classification and came up with code R87.6, which assigns the case to the statistical category 'abnormal cytological findings or abnormal papanicolaou smear', (WHO, 1994:13) which she keyed into the system. She was asked whether she would change this at some future date:

'When the histology report is received, and if I happen to have the casenote still, and if the histology report showed a malignancy I would go back and change the diagnosis I've recorded to the precise condition suffered by the patient, not least because the hospital must register all malignancies with the Central Cancer Registry.'

In addition, she deciphered from the Consultant's handwriting, after some effort, that the patient had an intra-uterine contraceptive device in place, which she also coded.

A second screen was then accessed, which allowed one primary and five secondary procedures to be coded. Looking at the casenote, the coder stated:

'I can't actually read this but it must be a biopsy.'

The primary procedure was, therefore, coded using OPCS-4 as Q03.9; 'unspecified biopsy of cervix uteri' (HMSO, 1990:154). The coder also coded P27.3; 'colposcopy,

not elsewhere classified' (HMSO, 1990: 153). She went on:

'I know this was not written in the notes as having been performed, but I know one is always done.'

Asked how she knew she replied:

'Everyone knows, we (coders) all agreed this.'

Once the coder had completed the data entry for that patient she registered this by filling in the completed box on the screen. The system was then immediately updated for all users.

A number of issues were evident in the above scene. Firstly, the characteristics of the source document, in terms of purpose, content and legibility were clearly problematic. Secondly, and this has already been discussed at length, there was an assumption that the kind of data that was needed, in terms of both its objectivity and its coverage, existed, or should exist, in the medical casenote. Thirdly, a whole range of organisational factors were at work which rendered the pure process of data extraction and collation inadequate and transformational in terms of the meaning of the data that was extracted, not the least of which was lack of training. As noted above, the only training some coders received was from the person next to them or from their manager. This had a significant impact on data which was already perilously loosely connected to clinical reality, as one clinician explained:

'This leads to some ridiculous errors. We have had hysterectomies coded to the Eye Unit.'

When this lack of training was combined with lack of access to clinicians, more 'ridiculous errors' occurred, as described in later interviews with one of the developers of HRGs:

'.... some medical costing work showed loads of rigid bronchoscopies (in the coded data). The respiratory clinicians said they had gotten rid of rigid bronchoscopes five years earlier, but nobody had told the coders.'

This was explored with coders. The following response was typical:

‘We would like to work closely with the Consultants, and in some hospitals coders do, and it works well. But ours don’t want to know. They have no time for us.’

Although the implication here was that this behaviour was unreasonable, some clinical awareness of the inappropriateness of the classifications to clinical work might arguably have been the cause.

Thus it emerged that the first line of scrutiny of clinical data in relation to the demands of the classifications, the coders, were a group which relied for doing its job on knowledge which, even where formal, and even if model inconsistency were not an issue, was inadequate. They were not equipped with the kind and level of knowledge demanded by a source document like the medical casenote. They were also without the wherewithal to challenge the validity of clinical data, or their own activities, for classification purposes.

Increasing evidence was also amassing for the notion that this was the point at which ‘transfer’ of knowledge was broadly lost and that actual construction of situational realities began. Whatever the level of training, coders’ views of the clinical world and clinical information were shown to be defined by the content, structure and rules of their own frames of reference. These included, primarily, the imperatives of organisational arrangements and demands, and the classifications, in terms of what they looked for and how they recorded it. It was also combined, inevitably, with a similar constellation of personal characteristics as were shown to affect clinicians and classifications, the difference being that in classifications these characteristics are ‘frozen’.

A focus was then placed on the extent to which this situation was known amongst coding and clinical groups. This revealed that where coders’ work was checked, and this was not always the case, it was usually checked by occupational peers. As one commented:

‘We do have a system of audit, our supervisor samples our work’

One Ophthalmic Consultant described how he routinely checked classification coding to ensure accuracy to his own clinical statements:

‘There is rarely any change to the meaning of the clinician’s data when classified. ICD and OPCS cover the same domain in Ophthalmology as the clinical knowledge in the casenote.’

However, as he went on to note:

‘Ophthalmology is conceptually one of the simplest systems in medicine....’

Possibly, therefore, his comments regarding domains should be read in this context. Earlier comments regarding the difference perceived between the domains of the classifications and clinical work came from a generalist physician, whose work spanned the spectrum of that which is encountered clinically.

This was evidence also, however, that models and translation could be true to the original, in some areas. The overwhelming issue, however, was that this was assumed, on the basis of no identifiable evidence, to be the case across clinical work. In exploring this with clinicians the following response was significant:

‘Most of the contents of ICD-10 are a list of diseases that cause death; diseases that in medical practice on the living are very difficult to pathognomically diagnose.’

Another clinical participant to this research, as discussed earlier, elaborated further when discussing coding diseases in ICD-10:

‘There are a few you can, for instance a blood sugar above a certain level is pathognomic of diabetes mellitus, but this happens very rarely. In General Practice I would say less than 5% of the time.’

This echoed a statement from as long ago as 1825 by John Finlaison, who testified before a Select Committee that, while mortality was subject to a known law of nature, sickness was not. Such a situation was as unacceptable to the Government of 1825 as it is to the Government of today, where management by credible and impartial means is considered to be an integral part of Ministerial work. This went some way towards explaining the application of ‘governing laws’ or scientific principles to a somewhat interpretive area.

Interviews then sought to take this situation forward to the arena of clinical coding.

One clinical participant observed:

‘Consultants see approximately 2-3% of a GP’s patients, and we are getting more into the labelling stage there, but the key even for the hospital doctor is still what the patient is complaining of and what he finds the label is the least important thing to him, so tends to be the least well recorded he is treating a whole constellation of symptoms, looking at tests as well. What he finds, the label, might just happen to coincide with something in ICD-10, but it might just as often not.’

Another went on to advise:

‘The coder wants a reason the patient was treated, but their mental picture of this reason is something from ICD-10. *Sometimes* this coincides with the reality of what the clinician saw and wrote, like in some straightforward cases like diabetes and epilepsy, but that is serendipitous when it happens As often as not the Consultant is treating symptoms, so he might write ‘right loin pain, ?kidney stones’, and may even find stones, but the only real ‘diagnosis’ at this stage is ‘renal colic’, because the doctor does not know if the stones are causing the pain. Lots of people have them with no pain.’

As discussed earlier, this view was checked by presenting this case to a number of coders. They advised they would code ‘kidney stones’ as the main diagnosis, because, as one of them asserted ‘that was the problem’.

One reason for this pursuit of the definitive was found in discussions with the HES office. They advised that, in Government returns from hospitals on live patients coded under this system, high percentages of patients with signs and symptoms recorded as the main reason for treatment were deemed by HES and by coders to be an indicator of poor quality data. The belief was that vagueness was the exception, not the rule, in clinical work. When coders were questioned about this issue they responded that:

‘Sometimes a sign or a symptom is all that is in the casenote, and when you can get to talk to a Consultant about it, they provide no more information.’

This was quite at odds with the assertion of a clinical participant that:

‘Doctors treat symptoms until, or unless, or as well as the condition - if it ever becomes known, which it regularly, in some specialties, like Gastroenterology, does not.’

This type of finding again demonstrated the difference between the perceptions of clinical reality which existed in the problem domain.

Comments and discussion ultimately showed that this assumption revealed more about the non-clinical perception of clinical work than it did about clinical work itself. Briefly, these confirmed findings from the literature review that clinicians sometimes never definitively ascertain the clinical problem. This assertion also found support in comments, discussed at greater length below, by the developers of HRGs. These showed that attempts to classify medical work met with much less success than those aimed at surgical work, work handled by medics being generally much more characterised by uncertainty than that handled by surgeons. By implication, application of a defined treatment, like surgery, apart from when it is exploratory, indicates understanding of patients' clinical conditions to the extent that predictive action can be taken. Again, this gave support to one of the very earliest assertions of this thesis, which was that the complexity of reality is such that a variety of investigative and explanatory tools are required. It also gave support to the assertion that the clinical world spans that spectrum. What was becoming evident was the transformational, if pragmatic, application of the same data handling techniques to the totality of that spectrum, rather than to those parts of it which had appropriate characteristics.

In reflection of its changed focus, WHO (1993) now define the purpose of ICD-10 as to:

‘.... permit the systematic recording, analysis, interpretation and comparison of morbidity and mortality data collected in different countries or areas and at different times.’ (WHO, 1993: 2)

It remains, however, primarily a list of causes of death and, as noted by one of the clinical participants:

‘Causes of death are not common causes of illness in life. ICD is only comprehensive in terms of causes of death.’

Thus, earlier observations about the effects of the frame of reference of coders, and the notion that transfer of information was not happening, were reconfirmed. Reflecting on the analytic category of ‘Social Rationalists’ it was considered that ‘social construction’

of reality rather than any notion of transfer remained appropriate. The versions of reality observed: clinical and classificational, while being influenced to one degree or another by the unique psychobiology of each of the participants, both as individuals and as groups, could be seen to be most highly characterised by occupational social influences. Thus, the coder was observed to 'construct' a reality from the casenote that was consistent with broad, non-clinical expectations, in terms of the classification, and reflected the social phenomena which produced it much more than it ever reflected the clinical reality. The clinician was seen to construct a version of reality which lay within the predefined parameters of medicine. As will be seen later, the statisticians and Ministers were observed to construct, and ensure maintenance of, a reality which served the vested interests of Government and was consistent with the imperatives of global control within which Government works. Government reality also depended, by necessity, on statistics as the afore-mentioned 'technology of distance' (Porter, 1995: ix) and of those lacking expertise. Meaning created within this setting was, therefore, seen to be static. It was not transferred, as was the general perception, rather it was created anew out of the frames of reference of various groups. In that sense it could be seen to create and maintain a 'situational' reality, which was based on paradigm-located social factors. It was also one which was bolstered by ontological protectionism and imperialism, which sought to promote, or even impose a worldview and, thereby maintain it. This interpretation of these activities was further supported by Giddens' work on Structuration Theory (1976, 1984). It was also deemed to provide a justified, real life example of that theory. Thus meaning was observed to be the product of each group and was seen to remain undisturbed, hence the continued ability of statisticians to base their information to Ministers on what were perceived to be objective, scientific facts, but which were, more often than not, observed to be subjective, tentative opinion. This key issue of social construction of reality is dealt with in more detail in the next chapter.

8.2 The Coding Process: Further Findings and Reflections from the Fieldwork

The focus of the ICD was, therefore, shown to be different to that of clinical work in treating the sick. WHO do make it clear in their instruction volume (WHO, 1993) that ICD is not intended or suitable for indexing of distinct clinical entities, or for use in

billing or resource allocation, the implication being that it deals in broader types of aggregation. This does not, however, reflect any awareness of the domain issue. In addition, this did not deter the Government. ICD had been used in hospitals for collection of morbidity data, based on distinct clinical entities, for over twenty years, and continued to be so. Some insight into why the Government had so favoured this system may be provided by the comments of a practising clinician:

‘If you want a service based on activity and numbers you use ICD.’

In addition, however, the social basis of some forms of authority warranted exploration. As noted by Porter (1995):

‘.... the culture of ‘public’ bodies, life and servants licenses academic specialists
..... to assemble very specific findings.’ (Porter, 1995: 7)

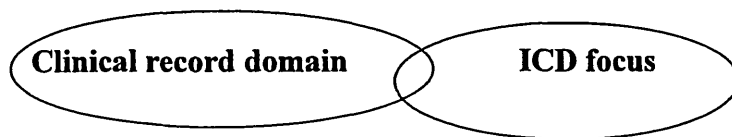
As discussed in an earlier chapter, the nature of these findings could be seen as lending a required and influential air of objectivity to pronouncements made on the basis of them. Arbitrariness and judgement appear to have been dispensed with. This both protects the Governmental user and:

‘.... lends authority to officials who have very little of their own.’ (Porter, 1995: 8)

To return to the nature and root of the conflict with clinical phenomena here, this was perhaps nowhere more clearly demonstrated than by the emergence of Read 3. As discussed earlier, one of the clinicians involved in the development process advised:

‘I could not record and code the clinical statements I needed to using ICD or OPCS. Before the decision on developing Read was finalised a colleague got the Heads of the Royal Colleges to try to find in ICD all of the clinical statements they routinely used, which had exactly the same meaning as their own statements. I don’t know the figures, but the percentage success rate was small enough to encourage strongly development of Read The two domains are just different. If I was to draw it, it would look like this..... :

GP work:



Hospital work:

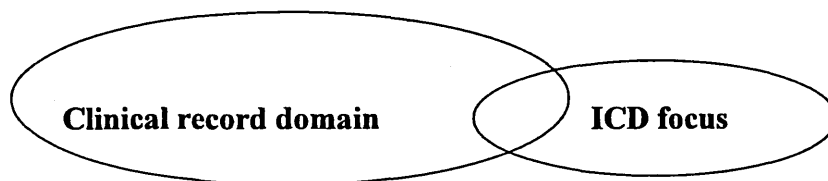


Figure 4, Clinical and Classification Domains

..... A slightly larger overlap exists between the ICD and hospital work but only because hospital doctors are forced to put morbidity labels on patients, which they dislike doing, and they often don't do, for the reasons discussed earlier. The ICD is used by the Government to enable it to know why patients used hospital services. But if the clinician does not know, and this is the case often enough, and if each patient has a reason for using services assigned to them, the data produced, whether manually or by using a mapping table of some sort, must be suspect.'

As a colleague of his asserted:

'Even if clinicians always knew they would often assign patients to the ICD category simply titled 'Other reasons for contacting healthcare services.'

As discussed by Clancey (1995) in his work on coded terminologies:

'This push to formalise medical description into a standard vocabulary is blind to the nature of conceptualisation and interpretation typical efforts to formalise medical records proceed as if 'doubt' is not part of a physician's vocabulary.'
(Clancey, 1995: 8)

As discussed above, a tentative nature in much clinical work had been revealed, and it now appeared that, not only was the significance attached by clinical and non-clinical groups different, the DH according it the status of objective fact, but the fundamental domain of interest was different also. Thus, to return to the analogy of the Indian house, our Eskimos can be seen to have built a dog sledge. The DH data used the socially

agreed labels; it described diseases and mental illnesses, but the details it provided about these labels could increasingly be deemed to have no more than a passing relationship with some of the clinical experiences on which it purported to be based. As one clinician put it when looking at some of the statistical data about his practice:

‘These figures are wrong in enough instances to make me doubt the entire set. I suppose I passed a few of these patients in the corridor - I can think of no other contact I could possibly have had with some of them.’

Thus the labels and the resulting data could more accurately be seen to have a primary relationship with the model of clinical work which persisted among the non-clinical groups at issue, and with the social context of those groups. This again further strengthened hypotheses regarding the dubious rationality of healthcare policies based on this data.

Another clinician went on to point out issues, not only with the ways the classification models reality, but also about the transfer or portability of specialist knowledge outside those specialist groups:

‘The labels in ICD and OPCS are collective descriptions which are designed to reflect the entirety of any entity assigned to a category. How can a person who has not been clinically trained decide what individual clinical entity belongs where?’

Thus it seemed to be the case that, even if the model were consistent, ability to accurately populate it in the current circumstances would be limited, and ability to transfer knowledge and information similarly restricted.

In addition, as Giddens (1976, 1984) has argued, all social structures, and this would include professions and systems, are the product of reflexive actions. We create them and legitimate them by trying to work with them. They are a product of a worldview. Their implementation in a professionally and paradigmatically diverse situation inevitably reflects a power struggle of some description. A key question was how far apart the worldviews in question in this research were. The classifications stem from a rationalist, objectivist philosophy, which embraces the scientific paradigm, and reflects a belief that the reality in question is an external shared phenomena which can be accurately captured and described. But if, as argued by Schatzki (1983) the meanings

of phenomena and one's understanding of them are complementary, and socialisation results in understanding the role items play in our activities, the cross-profession and cross-paradigm portability of specialist knowledge by outsiders must be questioned. This research has shown that, within the NHS, there were two models of information recording, of information requirements and of decision-making processes. The clinical 'narrative' has been shown above to be context-laden. Elements of that narrative were extracted from their original context by outsiders, and structured. This process itself created structure, e.g. the fields on the computerised database and the categories of the classifications have context assignments, but it has been shown that the context of the fields and categories was not always the same as the original clinical context. Some context was lost and some imposed, as assumptions about it were structured and employed on the basis of diverse frames of reference.

8.3 HRGs: Findings from the Field Work

The issue of different domains was found to be perpetuated in the HRG system, as it is based on ICD-10 and OPCS-4. Exploration of HRGs was also useful, however, in that access to its developers provided further evidence for highly subjective, socially, rather than scientifically-defined categories and, therefore, for further challenge to healthcare policies based on statistical clinical datasets.

Selected data classified using ICD-10 and OPCS-4 was routinely and statutorily further transformed by hospitals using HRGs. As discussed, this was the Government's chosen instrument underpinning contracting within the internal market. As described by one of the developers:

'HRGs were originally designed to enable description and measurements of treatments provided in hospitals so that budgets could be rationally allocated.'

Basically, in a number of specialties hospitals had to demonstrate that the contracts they set had been informed by applying this system. As another of the developers went on to say:

'HRGs work by classifying the mix of therapeutic activities into clusters which are clinically meaningful and homogeneous with respect to resource use.'

In that respect they were a typical example of a pragmatic trade-off of detail in order to render complexity manageable, and of a 'rationalist' approach to defining, understanding and negotiating reality.

In exploring this notion of rationality further, as discussed above, the data showed that the most fundamental belief underpinning this system was, therefore, that the universe of discourse; clinical reality, could be acceptably, if not entirely successfully, captured in classifications. However, after that, the basic characteristics of HRGs were totally driven by a belief that clinicians, as the key gatekeepers of NHS hospital resources, would have to be involved in using the system, and it would, therefore, have to be written and structured in such a way that it would appeal to them. But, if it was to do the job, it had to also produce categories that were resource homogeneous. The issues this created were described by one of the statisticians working on the development of Version 3 of the system:

'Firstly, as there is no usable direct data about resource use, length of hospital stay is used as a proxy. The aim, therefore, was to group together all treatments or conditions with sufficiently similar lengths of stay to inform users that any patient with a given condition or treatment should be likely to stay in hospital for a given number of days.'

Rationality and control of environments through prediction were, therefore, at the heart of the system. The statistician advised:

'I wrote a programme yielding about fifty descriptive statistics for each group I then used a statistical 'reduction in variance' technique to improve (the homogeneity of) the group further Each group was split and resplit, formed and reformed on this basis until the sharpest predictive tool possible was produced.'

However, as mentioned above, it was found that this technique was not universally effective:

'It works well in some specialties and not as well in medical specialties, particularly in respiratory medicine.'

Asked to comment on why this should be, he replied:

'Most of the variability comes down to differences in clinical practice.'

When questioned further about this he replied:

‘There simply can be no excuse for the vast variations in resource use we see when we look across the country through the datasets. Why should treatment of certain conditions take three times as long in one hospital as in another? We feel that by publishing this kind of data we can standardise practice much more than at present.’

The implicit assumption, therefore, was not of an unavoidable level of variance, given differing levels of expertise, insight, patient input and data collection systems etc., but of an unnecessary and unwarranted laxness in clinical practice. This was not supported by a clinical participant, who advised:

‘.... There is a much clearer understanding of surgical interventions and the resources associated with them. It is less easy to categorise in medicine. There is no process for this in medicine in terms of activity; people tend to think in terms of conditions response to treatment is less clear in medicine.’

In either event, it seemed the world simply refused to fit the system, although this did not stop attempts to make it do so and, consequently, to infer and imply that it did. However, when questioned further on this issue an HRG developer admitted that:

‘Nobody has ever forecast resource use and cost using HRGs and then checked how well they did after the allotted period.’

It seemed the system gave the appearance of control but little more.

This description of the system could, arguably, characterise it as lacking validity, but this should be considered in the context that the central development figure was a trained clinician. Thus, an alternative view might be that, providing its severe limitations are known, it is a pragmatic attempt to gain some insight into the quicksilver phenomena that can be clinical work, from the perspective of resource use. The danger and the difficulty seemed to be, if a return is made to earlier discussions about perceptions of computerised data and of statistics, that remote users lost sight of, or were usually unaware of these limitations and were primarily affected by the socially-defined characteristics of truth, certainty and objectivity which, as discussed in an earlier chapter, attaches to computer data and to clinical work.

Returning now to a statistician developer of the system, what he referred to as the 'subjective elements' of clinical work, were, in his opinion, added to by clinicians' subjective knowledge of their work as it related to resource use. Version 1 of the HRG system had relied more on what clinicians said about treatments and conditions with similar lengths of stay and less on statistical analysis of the data. This was found to result in a situation where, when analysis was performed, group distributions were found to be unacceptably erratic. In other words, as one developer put it:

'Conditions which should have attracted similar lengths of stay were found not to.'

The belief, however, was in the system, or at a deeper level, the belief was in the appropriateness of the rationalist model, which characterised the system. It was assumed the clinicians were wrong in their subjective assumptions about treatments and associated resource use. Even so, the developers stuck with a socially-defined need to appease the clinicians first. As one participant put it:

'We have to start with a clinical structure and then adjust it with statistics, or else clinicians will not engage with the system, they will not use it and, if they do not, we will not be able to refine it.'

This led to other structural issues as later versions of the system developed:

'This is nowhere more evident than in the number of (case mix) groups which make up the system, which is 530. The same statistical performance could be achieved with 10 groups, as there are only that number of distributions that cover the whole of clinical work within HRGs this would be adequate for finance managers, providing ten simple cost bands However there would be no clinical meaning to this There are a percentage of groups that exist simply because people want them.'

As another of the developers put it:

'The system often reflects the vested interests of the clinicians and not the needs of the system for internal consistency.'

The developers saw this, predictably, as undesirable, although the alternative 10 groups might arguably be seen as pursuit primarily of statistical elegance rather than an accurate model of clinical work. The ten tidy distributions could be simply an artifact of such questionable data.

The above types of issues were found to apply also to ICD-10 and OPCS-4. For instance, the Orthopaedic chapter of OPCS-4 is noticeably more detailed than any other. As one of its designers confirmed:

‘This was because the Orthopods shouted loudest during the revision process.’

ICD-10 contains a mechanism for coding and identifying not only manifestations but also aetiology for some diseases. Coders were observed spending a great deal of time and effort trying to ensure they applied this mechanism in accordance with the rules of the classification, in the belief that, as one coder put it:

‘This gives us better quality data.’

This was even though this information was not always in the casenote. They were generally ignorant of the fact that this characteristic emerged, not because it was statistically useful, but as a ‘sop’ to the clinicians consulted during the system’s development, who thought it necessary for their own purposes. Hence the continued relevance of the category ‘The Social Rationalists’ and a deepening insight into nature of the relationship between the data produced by these systems, the realities this helped to create and validate, and the clinical reality which underpinned it all.

Thus, earlier comments by Porter (1995) to the effect that such categories are socially-determined were borne out and, together with this data, enabled the apparent ‘rationality’ of such a system to be questioned. With that was also questioned the ability of such systems to ensure the ‘faithfulness’ of any representations of reality they produced. The classification’s structure and content reflected a particular philosophical commitment and largely social issues of power and negotiation. As one of the developers put it:

‘They (HRGs) are based on coded information, which is difficult to validate on clinical judgements, and expertise, which is difficult to gainsay ...The level of specificity precludes doing all we want to; diagnoses do not classify activities, they classify problems, so for the medical (as opposed to surgical) specialties HRGs are not classifying what they do They involve aggregations of data (so) they inevitably involve a trade-off of specificity against construction of general classes.’

All of these problems were, however, rationalised by an empirically unsupported belief in the need for, and success of the system:

‘It is deemed (however) that users achieve their objectives more than if they did not have these (HRGs).’

It seems logical that, if more is known about something, in this case about the resources used in clinical work, it can be better planned and controlled. However, this logic presupposes users were actually learning more about these factors. This was not proven and it seemed likely, given the data presented and discussions thus far, that the presupposition could only ever hold true in certain areas of clinical work. Typically these seemed to be surgical areas, or areas where behaviour might predictably be based upon understanding of problems, rather than in areas more characterised by conjecture, like medicine. Overall, knowledge improved, but that improvement was not consistent in all areas.

Another developer was asked about his views on the contents of HRGs in terms of data inputs, in the context that the statistical literature indicated a requirement for statistics to be based on objective, factual information. He responded:

‘I am not a clinician and I am therefore removed from direct knowledge about this I believe they (clinical observations) are a mixture of objective measurements – tests, etc., subjective medical opinion about what happens, and a lump of culture I also believe that in order to have good statistical data you need is data which is objective or is perceived as objective.’

Questioned further about this last point, he continued:

‘One of the main things we are trying to do at this stage is get people to think about and examine what they do. Presenting data does that.’

In other words, totally faithful reflection of reality was not at issue; the system was recognised as providing some insights of some types, and as being reliant on other insights. Biases were, therefore, confirmed as being inherent, but could also be perceived as neither good nor bad, right nor wrong, rather simply as inevitable. The need was for informed awareness of these biases. Once again, however, the problem was that remote users, who were not involved in the system’s development, were

subject to socially-defined misconceptions about such systems and the data they provided.

8.4 The Managers

As a key stakeholder group, hospital managers were interviewed in order to find out what this data meant to them, in other words, what their perspectives and assumptions about it were. As one manager put it:

‘Activity by contract and how that generates income is the key information running hospitals.’

This sounded logical and promising in terms of the use and validity of clinical data, particularly as he went on to advise that three items were necessary to assign a patient to a contract and, therefore, generate an invoice for payment for hospital services to the purchaser of care. The three items were specified by him as being:

‘... a post code, whether or not it is a GP fundholder, and the clinical coding, as prepared from the contents of the medical record.’

In his view:

‘.... the first two are straightforward (but) regarding the clinical coding, we are only interested in whether there is a clinical code and the order of multiple codes, because that determines payment amounts’

Again the notion of transfer of information from the clinical record to the statistical data set became increasingly questionable. Another manager explained further:

‘So for instance, where a patient has had an abscess removed and has also had a bone marrow transplant it is important that the transplant is coded in the first position on the computer. Only what is coded in the first position is paid for, and it is massively more expensive to do a bone marrow transplant than to remove an abscess.’

When questioned about the accuracy and general validity of the clinical data, he replied:

‘We have no way of checking whether the coding is correct, apart from by audit, which we are not equipped or structured to do we look for missing codes So long as the procedure fits with the specialty we look no further really.’

Further evidence that this might be the case was found in the quote discussed above, from the manager who, in order to clear a coding backlog, coded all Orthopaedic cases as backache. To return, however, to this example of the bone marrow transplant, this issue was important. As discussed earlier, at the level of the DH, analysis of this data for the purposes of national data sets accesses only the first field on each clinical string. Only the first diagnosis and the first procedures coded were, therefore, used in routine production of Government statistical datasets. There was an important and, arguably, pragmatic schism here. The Government need was for data to be recorded in such a way that it can know the main treatment and condition of each patient accessing NHS hospitals. The hospital need was to ensure data was recorded in such a way that the most expensive operations, and ultimately conditions, were paid for. Research indicated that the two needs did not always coincide with each other or with clinical reality, although the extent to which this was the case could not be assessed, given the size and diversity of NHS hospitals and their patient populations, and the lack of adequate and relevant research.

In terms of how this affected the business, another managerial participant explained:

‘.... sometimes the price is challenged - the classification code determines the price (but) so long as the money coming back is roughly right who cares about the code?’

In seeking to understand this the views of a further managerial respondent were useful:

‘Budgets are set on a wide range of procedures or diagnoses and there is an expectation that this is roughly what will happen over the course of a contracting year. So long as the total number is large enough and on target, the Trust will generate enough income in a year.’

In other words, the contracting process was sufficiently crude to ‘work’ in spite of the data. Initial hypotheses that business management and planning, was not, therefore, a reliable process found support:

‘Planning for NHS managers is seat of the pants, not evidence-based.’

was how one DH participant put it. When questioned about any possible uses of 'clinical data', the manager responded that it was:

'.... quite removed from the running of the hospitalWe do use it, for instance, if we were analysing the day-case rate because we were expecting an increase and there was none, we would go back to the clinical data There is little other use of clinical data.'

There had been, therefore, a conceptual separation in the mind of this manager between 'finance data' and 'clinical data', even though one drove the other. Clinical conditions and treatments are the direct cause of patient expenditure. In exploring this it became clear that this was, to an extent, a residue of pre-internal market mindsets. As one participant explained:

'Before the advent of the internal market budgets were allocated annually purely on the basis of what you got last year plus a margin for inflation.'

Thus hospital management and clinical datasets had traditionally been unrelated, the one having no impact on the other. The prevailing business environment and working practices had done nothing to change that. As the manager went on to explain:

'.... it does not matter what they had wrong with them, something has to be done with them, so the ICD code is irrelevant.'

Although the internal market should have changed that, outmoded behavioural characteristics persisted, reflective of 'historical imprinting' (Stinchcombe, 1965). The fact that a gynaecologist who asked how many hysterectomies had been done in a given period was told '6' on the basis of the data, when it was common knowledge that there had been at least several hundreds, was seen by the manager to be of no consequence in terms of running his business. Many similar examples were found. An Orthopaedic surgeon routinely performed hundreds of hip replacements, but the coded data revealed under one hundred in a year. A Urologist was surprised to find coded data about his practice showed him as treating a clinical condition known as 'stricture'. He had no idea what this referred to. As far as the manager was concerned, however, to be successful he needed only to ensure that income approximately met expectations and expenditure. This could arguably be accomplished if most or all of the coding was

wrong, so long as the prices attached to the codes used added up to the right amount. Thus, as one manager observed:

‘Theoretically, if you had a price for bone marrow transplants of £10,000, and one for kidney transplants of £10,000, it would not matter if you coded all your bone marrows as kidneys; the income to the Trust would be correct.’

Thus the need for a link between the meaning of the data and its purposes, which is vital to preserving meaning, was missing.

This view of the world was further confirmed by one of the clinicians interviewed, who had been a Medical Director at Trust Board level for 3 years:

‘In that time the only clinical information that was ever used was when we reviewed casenotes in order to deal with complaints.’

Asked about the management process, he explained how this situation could persist. In his view:

‘NHS managers at Trusts do not manage.’

Another clinical participant further supported this view:

‘At Trusts decisions are made on the basis of no information, on the basis of length of hospital stay and numbers (of patients) only (and at DH level) to plan hospitals but not to run the service, not to run the business but then you must define what you mean by running the business.’

The evidence above demonstrated the management mindset in this regard. This evidence indicated that the clinician’s view of running a business was markedly different. However, as running the business was outside the clinical sphere of professional interest, each group allowed the other to continue.

Comments like those above about running the business, taken in conjunction with the some of the findings leading to development of early analytic categories: Communications and Knowledge; Knowledge Gained and Purpose/Need; The Nature of Two Businesses; Accounting by Objective Means; and Pragmatic Management, led to development of a second major analytical category: ‘The Rational Pragmatists’.

This category reflected observance, drawing on the data, that 'rationalism' is no less socially-defined than any other approach to reality. It also reflected observance of the significant behavioural differences between professional and non-professional participants. The former showed a loyalty to and, primarily, behavioural characteristics of their governing body, rather than their host organisation. The latter's loyalties, vested interests and behaviour were much more reflective of their host organisation's underlying culture and objectives. It reflected also observance of quite different views of reality amongst these groups, or rather of differing selections from available realities, both in terms of those elements deemed significant and in approaches used to negotiate them. The clinical professionals were seen to recognise clinical conditions, but at first hand, by direct, interactive application of expert knowledge, and often to attach tentative significance to those observed phenomena. The behaviour of the non-professionals was seen to reflect agreed organisational norms and assumptions, and was characterised, as discussed above, by indirect involvement with the real world of clinical phenomena, where 'knowledge' of it was much more based on an assumed, or inferred, model of reality.

What this evidence also further emphasised the need for was a review of the conceptual model of information flowing and being transferred round hospitals, and from hospitals to the DH. The term 'transfer' does not carry any notion of change. It implies movement without alteration, although it was considered by the DH that some change, albeit considered to be relatively minimal where Read was involved, was inevitable. As one DH manager observed:

'There is a limit in clinical coding to the amount of change you can avoid.'

However, his concept of change agents involved only the number of handling points the data routinely went through:

'The ideal is the clinician selects a computerised term and that flows through other systems, thereby cutting down on later transformation points.'

He expressed no insight into unavoidable change occurring when clinical observations discussed were classified. However, the evidence discussed thus far shows that

transfer was clearly not what was happening, certainly as far as the clinical domain and the hospital manager were concerned.

What was also important in this observation was the firm assumption that, in terms of real world phenomena, the focus of attention for both clinicians, in caring for patients, and the DH in running the business of caring for patients, was the same. There was no evidence of a notion at the DH that the elements of clinical reality a clinician would choose to describe in computerised terms might not be the same domain as that believed to exist by the DH. Indeed, as discussed by one participant, and mentioned above, it was assumed that what the DH needed for statistical datasets was contained in the medical casenote. Observations made during the research phase cast doubt on those assumptions and indicated that, even if there were not myriad issues concerning hardware, software and handling agents, transfer would not be possible because different realities were sought and constructed. These issues can be seen more clearly below in the discussion about Ministers, and in earlier descriptions of use of the clinical classifications in relation to the contents of the medical casenote.

8.5 The Ministers

It was not possible within the research to interview or observe Ministers directly. However, a number of senior Civil Servants were interviewed, to the level of Under Secretary of State for Health. Also, as discussed above, in terms of Ministers and the Government, the literature demonstrated that two characteristics of the NHS were of key importance here. Firstly, the NHS represents a commitment to a particular political ideology, and on that basis political images, ambitions and careers are developed and promoted. Secondly, it is funded by public money, with the result that Government has a key responsibility to demonstrate accountability in terms of how the money was spent and whether or not the public is getting the best for its money. During this research key elements in the Government's approaches to discharging this responsibility were the healthcare classifications ICD-10 and OPCS-4 and, to a lesser degree, HRGs and Read. The Government required hospitals to ensure that, using ICD-10 and OPCS-4 as appropriate, they coded the clinical conditions and treatments of every person who came into contact with the NHS and who classified as either an in-patient or a day case

(no overnight stay). Their precise instruction was as follows:

‘ Medical terminology as it is written by the clinician to describe a patient’s complaint, problem, diagnosis, treatment or other reason for seeking medical attention must be translated into a form which can be easily tabulated, aggregated and sorted for statistical analysis in an efficient and meaningful manner.’ (DH, 1994: preface)

The job of the clinical coder was to do this, i.e. to:

‘.... extract the relevant information from the casenote and to assign codes which represent a complete picture of the patient’s hospital stay.’ (DH, 1994: 1)

Statistical returns from hospitals to the DH, based on this data, are how the Government demonstrates to the public accountability for public expenditure. It is also partly how Ministers develop policy, as evidenced in some of the findings above and as also described by a senior statistician:

‘For instance the data is used to study waiting times for cancer patients, to determine the need for psychiatric in-patient services, and to plan acute-care services, etc’

Another managerial participant confirmed this:

‘For instance, we have two acute coronary care facilities in this locality. We have been examining the statistical data to try to decide whether it might be possible to rationalise these and have just one. So we are looking at how many AMIs (heart attacks) we have and the pattern of occurrence and so on’

Ministers, statisticians and coders were not only, thereby, seen to demonstrate a belief that such information was in the casenote, they also demonstrated a belief that it could be successfully extracted and transferred round the organisation. Furthermore, they promoted that belief and precipitated subsequent beliefs in the contents and validity of the data they produced, by acting upon the data and by publishing it. Evidence of this was found in the annual publication ‘Hospital Episode Statistics, (DH, 1998a, 1998b) which purports to publish lists and analyses of, amongst other things, diagnoses and treatments of NHS patients in given time frames. This publication is based on clinical data from medical casenotes coded in NHS hospitals, using ICD-10 and OPCS-4.

8.6 The Statisticians

The group that collected, analysed and presented these hospital returns as statistical data to Ministers is the HES Office. As one of its senior managers explained:

‘HES sits in the Statistics Division of the DH and belongs to the Government Statistical Service. Our loyalty is to the Department Minister of the day, like all Civil Servants.’

The importance of this statement lay not only in its implications for organisational loyalties and norms, etc., but also in its implications for clinical data. As another senior manager explained:

‘.... the Minister must not be embarrassed by the data and must, therefore, know if there is something embarrassing in it.’

In attempting to understand the notion of ‘embarrassing’ items in the data, it emerged that these would consist of:

‘.... unexpected changes in trends, like numbers of operations for instance.’

Steps taken to adjust such ‘anomalies’ as they were called by another statistician, are described below. It is interesting, at this stage, to note that the assumption was that it was a data quality problem, but only in the sense that it is assumed avoidable errors occurred during the coding process. These avoidable errors were believed to be due, as described by one statistician, to factors like:

‘... doctors’ handwriting coding expertise ... lack of coding training.....’

Belief in the integrity of the fundamental assumptions about clinical reality, and methods used to explore it, remained secure.

The same manager went on to advise that part of their code of practice dictates that HES should:

‘.... maintain the relevance of statistical activities to the needs of government....’

and that, working to their own code of practice:

‘HES must produce statistics in an objective, scientific and unbiased manner we will never put the figures in the light the Minister wants, we present facts only, not judgements.’

Interestingly no conflict between the two above-mentioned sets of statements was recognised by the participant. When asked what was meant by ‘facts’ the response was:

‘For instance we would say there had been a rise of ten percent in an area of disease, we would not say there had been a minimal rise.’

‘Facts’ in this sense were deemed to be so on the basis of fundamental statistical principles, which required that qualitative statements like ‘minimal rise’ were represented in quantified format. Claims to present the ‘facts’ did not necessarily, therefore, have a strong relationship with the nature of the knowledge in question, and might better be described, therefore, merely as quantified data. Thus, once again socially-defined construction of reality could be seen, in some ways, as was seen to be the case with clinicians. What the statisticians sought, how they sought it and what, therefore, was knowable about reality was determined by the context within which they operated. In other words, it was socially-determined. However, statistical models differed from clinical models in that they were not the result of direct interaction with the real-life phenomena in question. Rather, they were a representation of a representation of that interaction, and one reflective of very different frames of reference.

In trying to explore this further, a statistician was asked how ‘factual’ the contents of clinical casenotes and of coding were. The response was:

‘We take a lot on trust at present. We recognise that we must establish much closer links with coders and that we need more clinical and coding knowledge here at HES. All our staff have now had one-day awareness sessions on clinical coding and one has had a three-day course, but we know we need more. Really, I think we should put our figures out as ‘best estimates’ not as facts.’

While this represented a laudable admission that knowledge of the data was not all it should be, it also reconfirmed two important assertions. Firstly, the implicit message in this statement was that, if there was a deviation from reality in terms of what HES got from the clinical coders of medical casenotes, it was due to coder issues, not to the

basic content of the casenote. Secondly, it reconfirmed the assertion that there was an underlying assumption that what was needed was in the casenote. Further evidence of this was gained when participants were asked what the 'ideal' would be for HES in that context. As one responded:

'If doctors were to write legibly and coders were well trained and data was sent to us in a timely way, it would improve quality immeasurably.'

Lastly, this shed light on how this situation could exist. HES admitted considerable lack of clinical knowledge and of understanding of clinical phenomena. The degree of fit between tools like ICD-10 and OPCS-4 and clinical work was, therefore, taken on trust. They were the Government's chosen instruments, and had been in use for a long time. They might, therefore, be argued as having achieved cultural and organisational sanction. They were part of the way things were done at the DH, to the extent that their use was not challenged.

In exploring these issues further, the concept of quality of data was pursued. Time did not permit direct questions about how quality of HES data was measured, although reference to a range of HES publications indicated that the dimension of quality most focused on by HES was coverage of records, i.e. what percentage of the hospital population was captured, rather than any notion of relationship to observed clinical reality, because, as discussed above, this was assumed. The stated aim of HES was:

'.... to capture allepisodes (of care).' (DH, 1997a)

HES participants were asked what, if any, routines they performed on the data in relation to the quality issue, particularly in terms of any basic changes to it:

'The data is sometimes changed. Where we are 95% certain we are right which fields in a record are wrong we change them. We still however have, for instance, 'male pregnancies', which we cannot change because, with no access to the casenote, we have no way of knowing whether it is the gender or the condition that has been wrongly coded. In any case the data is quite historical when we get it and we handle millions of records.'

Notions of what was right and wrong in the data were, therefore, believed to be based upon the model of expectations arising from familiarity with the data. In other words, these notions were a result of observed patterns and trends, as much as they were

common sense. This was a fine example of what Porter (1995) described when he discussed his assertion that:

‘.... any domain of quantified knowledge is, in a sense, artificial.’ (Porter, 1995:5)

Thus the frame of reference for sense-making was built around and from the world described by the data. Expectations and assumptions and, therefore, actions could be explained in these terms. This was not, as it may appear, a departure from the basic premises of this research. It did not condemn the statistician’s worldview as fundamentally lacking integrity. Rather it must be viewed in the context of earlier philosophical discussions, that, as Porter (1995) goes on to assert:

‘... reality is constructed from artifice.’ (Porter, 1995: 3)

This can be viewed then, as simply one form of artifice. What was at issue was not the artificiality of the view, but rather, as stated earlier, its relationship to the artificial model of reality on which it was built.

In terms of other changes to the data, a DH publication (1997a) indicates ‘grossing’ is done. A HES manager explained:

‘Grossing was done for specific publications, for instance the official annual Government tables of numbers of operations and conditions split by various means: by ordinary admissions, by ordinary admissions and day cases, etc. Hospitals rarely use these publications. Grossing was done to balance the figures; we knew from other returns what numbers should be in HES so what used to happen was we inflated the returns from (X) whose data was so bad nobody could tell, until the figures balanced. It is still done to an extent but as little as possible.’

Thus the underlying model for this data moved further from the underlying clinical reality and became characterised more by pure mathematical precision and ‘tidiness’, the focus being on balancing the figures. What, in effect, this did was add validity and power to all sets of figures involved, to the extent that, as one manager put it:

‘Strangely, the further you get from the clinical workplace, the greater your confidence in the data’

This was not felt to be so strange when consideration was given to the fact that one set of figures which counts an item might, given sufficient knowledge of the collection procedures, have power in terms of user confidence in its accuracy and the reflection of reality it presents. This power is, however, increased where two or more sets counting the same thing from different perspectives each confirm the findings of the first. While at face value this balancing can seem, therefore, to be merely a mathematical exercise, fundamentally it could be argued to reify and bolster the strength of the resulting data.

Asked about percentages of records this affected, the participant was unable to provide a response, but could advise:

‘We also ‘clean’ the data. Cleaning really helps improve the data. In our view it means we call all the rubbish the same name, so it is easily identifiable. This has made the data much more accessible to users.’

Another participant supported these assertions:

‘Changing, grossing, cleaning all improve the data as they improve consistency, particularly from one submission to the next.’

In addition to the comments on reification made above, this statement, and use of the clinical classifications, was deemed to reflect a deep philosophical commitment to the rationalist assumption, so clearly evidenced in AI work. These included the assumption that there existed an external, commonly perceivable reality, which included clinical work and phenomena. They also included the assumption that this was logically ordered and could be successfully analysed by modelling the entities and relationships between them. Thus cleaning the data could only improve it. These kinds of observations reaffirmed the relevance of ‘The Rational Pragmatists’ category. They also further strengthened initial hypotheses regarding the misguided rationality of healthcare planning policies based on clinical data, and the impact of social influences. Together with findings from managers, and those leading to a number of earlier analytic categories, particularly Modelling Reality, Knowledge Gained and Purpose/Need, Models of Inquiry and Knowledge Gathering, and Knowledge Domains, these observations also characterised an approach to reality and to the reality expressed in clinical models, which was sufficiently different to generate a third analytic category: ‘Conflicting Realities’. At this stage this reflected observance, given

knowledge of clinical models of inquiry and communications mechanisms, of a discord between them and similar factors in the Ministerial and statistical realms.

Observance of social influences at this stage also led to further development of the category 'The Rational Pragmatists' into 'The Social Rationalists'. This reflected observance that, for all the calculative assumptions about clinical reality and the associated behaviour, in terms of investigation and reflection of that reality, considerable social influences were at work and, although apparently more 'scientific', the socially-defined nature of those actions maintained the status of ensuing knowledge and information as insecure. As has been seen, the almost total lack of insight by the non-clinical groups into the reality, as perceived by clinicians, which they routinely reconstructed, led to a judgmental, subjective, albeit possibly unwitting, representation, and one which was no less defined by social norms than that of clinicians.

The next chapter takes this range of findings and draws together observations crystallised into the four key analytical categories, and offers a second level analysis based on that.

Chapter 9, Findings from the Field Work, Second Level Analysis

This chapter describes explanatory insights developed from the second level of analysis.

Initial conclusions confirmed and added depth to the findings from the literature review. In summary, these conclusions were that a percentage of healthcare data is invalidly transformed into fact, and that this happens as a result of enactment by individuals and groups of their respective social contexts. This included clinical practice, which was shown to be a knowledge-creating process. This set a context both for how data might be produced and also how it might be validly used in decision-making within and outside the domain of clinical work. It also included the social enactment processes of managers. This resulted in a tenuous relationship between clinical data and its statistical counterparts.

The supporting evidence for these conclusions showed that a degree of objectivity existed in clinical work, but this was not inherent in all areas of it. The clinical universe of discourse was shown as being often characterised by uncertainty, with most, rather than few, diseases being pathognomically very difficult to diagnose definitively. These findings were intrinsically bound up with those relating to the relationship between the social knowledge processes involved in clinical decision-making and the nature of data produced from those actions. Findings showed that even apparently scientifically objective measurements carry the subjective element of individual physical ability, skill and interpretive ability. This uncertainty was shown to be compounded by the nature of the practice of medicine, wherein the underlying scientific logic of medicine was shown not to extend to how medicine was practised or recorded. Uncertainty was also shown to be further compounded by lack of any definitions of clinical concepts and lack of training in clinical terminology, describing and recording. Thus, to the basic uncertainty of the universe of discourse was added heterogeneity in perceptions and description of perceptions. As discussed, one clinician's 'asthma' was another one's 'wheezy chest'. Thus, the evidence supported

the notion that uncertainty and subjective opinion were typical rather than exceptional in clinical work.

The evidence also confirmed a situation wherein, while the physical and procedural approach to clinical work was standardised, the intellectual one was not. Human influences were, therefore, active. Cognitive perception, knowledge, and data, in terms of methods of describing observations and views of elements of it, remained, even after the clinical training phase, subjective and heterogeneous to an unquantified degree. The process of clinical knowledge generation and application was, therefore, shown to have a phenomenological essence. This was not to say that definitives and absolutes did not exist, simply that no work had been found which analysed types of clinical knowledge in such a way as to list or spell out which phenomena fall into which category and what the relative percentages are.

Social factors continued to emerge as influential when a focus was placed on the nature of the key stakeholder groups, and of their relationship to each other and their wider social contexts. These included human attributes such as ability, experience, and professional background and training. They also included loyalties, vested interests, beliefs, etc. These were shown to result in distinct and conflicting modes of behaviour. They affected perceptions of reality and selections from that reality. They also affected labels applied to describe those selections and decisions about information systems used to represent them.

Returning now to the original focus of the research, which was to examine the relationship between clinical knowledge, its social context and its statistical counterparts, the research showed that outside the clinical sphere meaning was not transferred, rather it was attached to a construction based on the meaning ascribed by non-clinical groups to the original clinical data.

In exploring why this happened, inter-group structures and interpretive schemes were shown to reflect not simply, for instance, the norms of the clinical or managerial professions, but also the effect of inter-group location and interaction. The nature,

therefore, of the relationships between entities, and their relative positions, emerged as influential.

One area of the real world was explored, that of clinical phenomena. It was explored, however, through the lenses of two different domains, that of the clinician and the manager, and two very different versions of that world were shown to exist. The following model of this dimension of the domains draws out their key characteristics, as revealed by the research, and shows their effects on information:

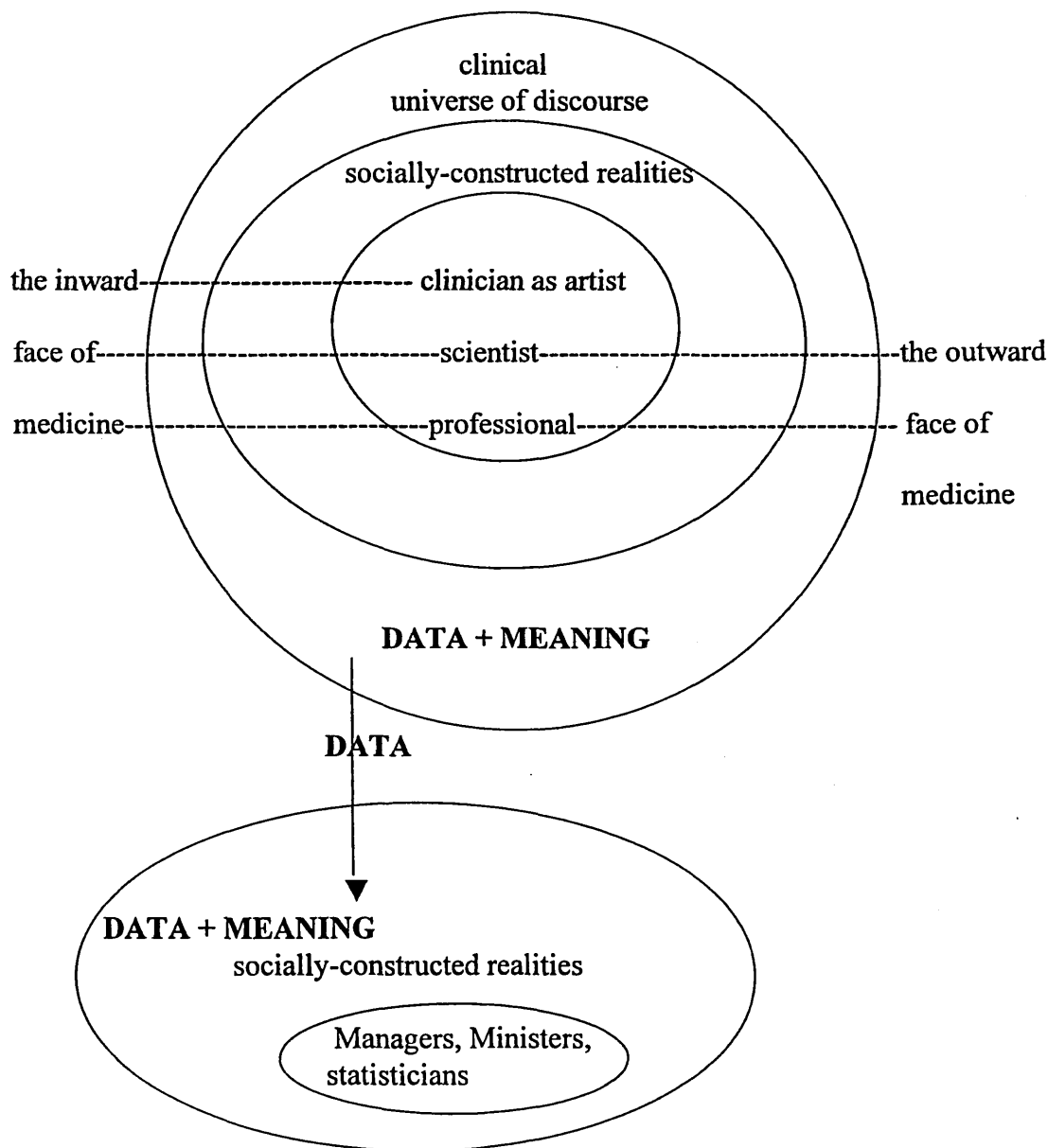


Figure 5, Two Domains

This model shows that analysis revealed not one unitary bureaucracy, but two separate domains, characterised quite differently. The first was the clinical domain, wherein clinical understanding of the universe of discourse was partly well structured, and partly poorly structured. There were areas of relative certainty and areas where knowledge was much more tentative. The second was the non-clinical domain, wherein understanding of the universe of discourse was held by its participants to be highly-structured. The belief within the non-clinical groups was that relevant aspects of the clinicians' knowledge of their domain were extracted from the data flowing from the clinical domain, and that it was definitive. However, as the model shows, data flowed between clinical and non-clinical domains. Meaning did not; it was created anew in each.

To expand upon this, at the centre of this universe the clinician enacted social context by engaging with reality in a manner consistent with the encompassing social structure of medical work, always with the possibility of changing those structures. The mutually constitutive nature of this context could be seen in a number of ways. It was one in which clinicians were self-regulating and had their expertise taken for granted. This knowledge provided 'a powerful control over nature and society' (Johnson, 1972: 33). This in turn meant, as noted by Barnes (1977) that only practitioners fully understood the implications of their own practices, so they were allowed the dominant role in controlling their application. The research showed that this combination of expertise, which to an extent made professional knowledge a 'black box' to lay people, and social power, not only assists with 'ontological protectionism', but also facilitates manipulation, for purposes of public presentation, of the nature of professional knowledge.

The fieldwork also revealed that medical structures of clinical control and professional closure were greatly strengthened by what Johnson (1972) refers to as:

'.... a highly developed community language or jargon.' (Johnson, 1972: 56)

As discussed, this performed the double function of maintaining internal homogeneity

and increasing autonomy from outsiders; both competing specialists and laymen. Thus clinical language is, in some respects, designed to 'repel all boarders', and achieve social closure (Bernstein, 1971) by, as discussed in chapter 4, assisting the process of 'mystification' of outsiders and thus maintaining the control of the clinical profession over what they consider to be the clinical universe of discourse. (Johnson, 1972). Clinical behaviour, aimed at rejecting the healthcare classifications and their data, and work on developing Read 3, can be considered as a further expression of the clinical desire to maintain this professional 'net' around their language in order to protect clinical freedom and professional status. It was also considered to be an expression of the kind of 'structural conflict', which is discussed in the next chapter. This was also, however, considered in terms of how this behaviour affected knowledge and information, and the realities perceived. To implicit collusion in scientific treatment of the clinical domain in order to buttress social status, was added this explicit pursuit of methods to maintain external mystification and, thereby, further reinforce that status. Action was also consistent with wider social structures, which require confirmation of scientific certainty in clinical work in order that medical structures can remain unchallenged.

In summary, the clinician presented two faces. The inward face combined that of clinician as artist, scientist and professional. This was the enactment of self played out amongst peers. The second was the clinician as scientist and professional. This was the enactment of self played out to the outside world. This colluded to produce a knowledge-creating context within which clinical knowledge and data were internally known to be less than totally certain and objective. Data produced reflects this. External groups were, however, allowed and encouraged to view this world as scientific and the data from it to be likewise. This outwardly scientific appearance has been seen to lead to such comments from senior DH managers as:

'Doctors are scientifically well-developed...'

Hence, the model shows data and meaning within the clinical domain, but only data flowing between that and the domain of managers and statisticians. Meaning of a different sort is created anew within the latter domain, as a result of that very specific

knowledge-creating context. Thus two socially-constructed realities are shown in the model, and two sets of meaning. This is not, therefore, a simple case of conflicting views of reality, in terms of it being external or not to the individual, but rather a case of an intricate social dynamic leading to emergence of what are only superficially straightforward and apparently isolated differences.

Moving to the managerial and statistical domain, behaviour here can now be argued to be a result, at least to some degree, of the behaviour of clinicians. That the clinical groups have been described as operating within the scientific paradigm might be argued from the same basis. However, Ministers are not scientists, and to that extent they are subject to the same social influences about the truth and objectivity of scientific work, and what presents itself as scientific work, as any other social group.

Statisticians might be argued to operate, by professional training, from the scientific paradigm, but again clinical behaviour has been seen to influence their perception about clinical knowledge and data as being scientific and, therefore, fit for their purpose. Thus the frames of reference of these groups have been shown to attach a status of 'truth' to clinical data, albeit within a recognition that the representation is not perfect, and their actions, primarily in terms of using that data in statistical operations and as the basis for far-reaching planning and control decisions, reflect that.

However, a focus on clinical behaviour provides less than a full picture for the motivation behind the different but consistent behaviour seen among non-clinical groups. Legitimacy for these groups has been shown to rest upon demonstrable ability centrally to understand, plan and control public affairs. The essential public credibility and trust this is designed to engender must be further ensured by presenting the appearance of informed management of the NHS based on high quality, impartial decisions based on good information. Ministers must acquire information, therefore, to support policy development and performance management, to illustrate variations in health status and delivery and to help determine how much taxpayer's money should be spent on healthcare and how it should be distributed (DH, 1997a). Classifications and statistics are a way of doing this. If sickness cannot be quantified, it cannot be centrally

controlled and managed, and it cannot be quantified unless it is mapped out, subdivided, and for ease, coded. In this sense it might be argued that, although clinical behaviour encourages a scientific perception of the clinical domain, this social imperative faced by Government results in a process which further reinforces that view.

Also, many different methods of describing and measuring are cumbersome and complicated, give no appearance of describing like as like, and preclude comparison and control on that basis. Hence the national application of a standardised classification for each domain: disease and treatments. As discussed by Porter (1995) the superficiality inherent in these systems, which by-pass deep issues, and their output, then provides the means by which Ministers can defy disciplinary and organisational boundaries, to link academic to political discourse. This has a parallel, as Porter goes on to discuss, albeit in terms of the arguably less contentious area of wheat and the wheat trade. Development of quality grading categories, to which all farmers had to subject their produce, eventually led to a situation where the knowledge needed to trade wheat became separated from knowledge of the product and its production. Trading knowledge came to consist of price and production data. Wheat could then be traded by people who had never seen it and never would, who could not distinguish wheat from oats. In the same way healthcare can be managed by people who have never seen the inside of a hospital and cannot not distinguish coronary artery disease from cancer.

As also mentioned above, what Ministers also need is the appearance of impartiality; their own judgement must not appear to be active or criticisms of bias and personal interest may result. As Porter (1995) notes, this is why faith in objectivity tends to be associated with political democracy, or at least with systems in which bureaucratic actors are highly vulnerable to outsiders. A decision made 'by the numbers' has at least the appearance of being fair and impersonal. As Porter (1995) also notes:

'Scientific objectivity thus provides an answer to a moral demand for impartiality and fairness. Quantification is a way of making decisions without seeming to decide.' (Porter 1995: 8)

Potter's (1996) work offers useful additional insights into how such 'facts' gain

further substance. He discusses how 'externalising devices' are used and goes on to assert that:

'.... this provides for the reading that the phenomena described has an existence by virtue of actions beyond the realm of human agency.' (Potter, 1996: 157)

Woolgar (1988) elaborates further, describing achievement of transfer of agency from author to phenomena by presenting 'facts' in terms of 'the data show' and 'it was found that' (Woolgar, 1988: 75).

However, as Potter (1996) further discusses, it is then a short step to the process of conflation of objectivity as impersonality and impartiality, with objectivity as truth, and behaviour undertaken on that belief:

'Thus support for objectivity is built up in part from constructing the facts, the record, the evidence as having its own agency. Such constructions obscure the work of interpretation and construction done by the description's producer.' (Potter, 1996: 158)

He argues that, basically, the empiricist repertoire can be seen to divest agency from the producer and invest it in the facts, by depersonalising accounts and investing them with the appearance of scientific method based upon universal procedural rules. Also, the official rhetoric of handling organisations stresses both neutrality and an emphasis on reporting facts, as was discussed earlier in terms of the HES participant. As Porter (1995) discusses, this rationalism has all the appearance of an effective tool for understanding a world it has itself helped to construct, particularly as it has never understood the world it has lost. But, as discussed above and as Potter (1996) argues:

'.... this official story about facts is itself a construction.' (Potter, 1996: 156)

Thus classifications in the NHS can be interpreted as media through which dissimilar needs and desires gain the *appearance* of commensurability, and where people's conditions and treatments are studied in classes which abstract their individuality. But, as Latour (1987) argues, and this has, to an extent, been shown to be the case in this thesis:

‘.... all measures construct a commensurability that did not exist before their own calibration.’ (Latour, 1987: 41)

The research showed that, by their actions and use of certain systems the Government did not simply take what it perceived to be objective clinical information and use it basically unchanged. Rather it ‘created’ what never existed in the clinical consultation: uniform categories of diseases and uniform classes of patients with those conditions. Their classifications and manipulations achieved, therefore, what might be described as internal consistency, in that the contents of each category were internally comparable and also comparable with other such collections of data compiled via the same mechanism. However, they were externally incompatible. In other words, they did not always describe the real world phenomena they purported to. Given clinical and other comments discussed above it is debatable whether these phenomena even exist. Clinical classification categories and statistics may be seen, therefore, to *construct* entities. Consequently, their application may be seen to be instrumental in the construction of a version of reality which is fabricated. It is based not upon investigation of the real world but upon a predetermined model, the relevance of which, to the real world, has not been demonstrated but has been criticised by agents in the domain it purports to reflect.

To return again to Structuration Theory (Giddens, 1976, 1984) this behaviour can then be seen not only to define the world that can be known, but also to direct future actions within that frame of reference. Thus, as Giddens describes, by their actions humans define their realities and by subsequent actions which reinforce them they often legitimise those realities. In the case of the Government and DH statisticians, systems have been selected which reflect beliefs about clinical reality, and which reflect required achievements in terms of allocation of resources and maintenance of a sort of power. This system ‘tells them what they want to know’. In this sense, as Porter (1995) discusses, statistics can be seen to have reflected values before it created them, and to reinforce those values thereafter. As noted by Barnes (1977) such organisations can be seen as searching for, or creating, the information that will maintain their role and appearance. Thus, statisticians suppressed ‘embarrassing’ data. The data actually

reported the belief that was needed to build the dataset, rather than the reality it purported to describe. Again, it must be noted that this does not reflect a situation of *transfer* of information, but one of construction anew of an artificial reality, based on a rationalist excision of detail and complexity, wherein, as observed in this thesis, statistical constructivism shapes notions of reality. Also, however, that is all it can tell them, by virtue of its design characteristics. This returns the discussion to the observation made by Barnes (1974) that:

‘.... scientific statements have taken on the nature of tautologies; science has been allowed to define what we hold to be true about the world.’ (Barnes, 1974: 5)

In other words, they have become, and could only become, self-fulfilling prophecies.

9.1 Summary of Second Level Analysis

The notion of the social construction of reality was, therefore, a key one in this analysis. Also key was the notion that this relationship between the individual and the social structures with which they interact is not a one-way process. Social enactment does not stand in a vacuum. In addition, longer-lasting social structures like, for instance, professional norms, have been shown to be equally active. Mutually constitutive factors and social relationships have, therefore, been observed and discussed. These insights focused these more mature stages of analysis in the direction of two connected areas of work, which specifically explore these kinds of perception: Structuration Theory (Giddens, 1976, 1984) and Actor Network Theory (ANT) (Callon, 1986, 1997; Law et al, 1989; Latour 1989, 1991, 1997, 1998). Both promised to provide deeper understanding of the observed phenomena and also an opportunity to contribute to current knowledge. Structuration Theory in particular appeared to be the theory which came closest to accommodating observations made. Further exploration using these areas of work is the subject of the next chapter.

Chapter 10, A Return to the Literature: Social Construction of Reality

This chapter takes second level findings and integrates them with relevant meta-level theory. This is done in order to achieve enhanced explanatory insights and also to contribute to those bodies of theoretical work. In particular, the notion of social construction of reality applies. Specifically, concepts developed in Giddens' work (1976, 1984) on Structuration Theory were used to explore the effects of sociologically-based frames of reference on creation and transfer of meaning. A review of this work found it to be an abstract and general heuristic theory, which explicitly excludes any explanatory or descriptive application to real-world situations. It was, however, perceived as coming closest to explaining observations made and as having great strengths in relation to this thesis. It provided a more likely conception of the basic possibilities of social life, and offered generic principles of the constitution of society, which were consistent with findings thus far, and against which further explanatory analyses could be attempted

The discussion then extends the notion of the social construction of reality further by addressing the concept of ontological security. This discussion explores the perception that both groups believe themselves to be dealing with the same universe of discourse and seek to promote and promulgate that view.

Organisational structure is then explored, in terms of the effects of the above factors on the transfer of information. This again draws on Giddens' work (1976, 1984) on structural contradiction and conflict as an explanatory factor and cites the complete lack of true communication between the clinical and non-clinical groups as evidence of this occurrence.

Actor Network Theory (ANT) (Callon, 1986, 1997; Law et al, 1989; Latour 1989, 1991, 1997, 1998) is then used in order to achieve a more fine-grained analysis which includes exploration of the relationships between human and non-human agents in the problem context. While not amounting to a theory, this work was seen as complementary to Structuration Theory (Giddens, 1976, 1984) in that it addresses a different and more detailed level of the social world.

10.1 Structuration, ANT and Further Findings

The research found that the social contexts studied were neither fully determining of their constituent individuals, nor were they fully determined by them. Rather, these structures were shown to emerge from a process of repetitive human action, which they influenced, but that action was reflexive rather than slavish. It was shown, particularly with clinicians, that they reflexively both drew on the larger social structures of which they were part and, by doing so, created and recreated those structures. Thus each was in a mutually constitutive relationship with the other.

That observation represented a departure from the two traditional and opposing approaches to understanding social contexts, which were those of the individual, of human agents and human action, and those of collectivities, or (structured) social systems. Neither fully accounted for findings from the research, which indicated that the arrow of determination does not point exclusively in either direction. What was of particular interest in Giddens' work was that he offered a view which does accommodate those findings. He asserts the existence of unifying factors in the social world, previously overlooked by earlier approaches. Giddens observes structure and action not as two independent phenomena, but as inextricably linked in social terms. He draws connections, therefore, between structuralist perspectives, which emphasise the bureaucratic and formal aspects of society, and the interactionist approach which focuses on less formal structures and dimensions arising from human actions. He argues instead for a social world which is neither exclusively determined by individuals nor determining of them. He perceives structures, or social rules and resources, being drawn upon by actors in a process which is mutually constitutive, wherein actions are formulated and reproduce social structure and change, or produce new structure.

In describing these 'structures' Giddens uses a number of labels, including 'rules', 'resources' and 'memory traces' (Giddens, 1984: 17). In light of some of the observations in this thesis, particularly in terms of clinical actions, the term 'frames of reference' is used here, by which is meant the unique and changing template produced by each individual's history, background, experience, social and professional training, etc. It is also meant to include the assumptions each individual makes about past and/or present and/or future contextual issues (for instance, as discussed, who will use the

information recorded in the casenote, for what, and whether actions will at some later date be challenged, etc.). Collectivities here are taken to be social groups characterised by often repeated and, therefore, enduring practices, such as organisations or professional bodies.

Thus, as observed by Cohen (1998) for Giddens:

‘.... everything in social life, from encompassing world-systems, to an individual’s state of mind originates in social praxis (that is the skilful performance of conduct and interaction).’ (Cohen, 1998: 280)

This focus on social praxis was influenced, to an extent, by the work of Goffman (1959, 1967, 1972) who undertook detailed explorations of interaction in everyday life. That mutual interaction is seen as being informed by both wider societal experience, and organisational norms.

Human agents are, therefore, seen as determining, but not overwhelmingly so, and determined, but not totally so. As discussed by Cohen (1998) given this mutability and perversity perceived in social praxis, it is out of the question for Giddens to insist upon the centrality of one mode of conduct (like Marx on Labour) or to perceive an inevitable destination for history (e.g. communism) or to claim that insidious practices or structures thoroughly dominate our lives (e.g. Weber on the ‘iron cage, Foucault on power and knowledge). Thus social life appears far messier for Giddens than in many theoretical works.

These insights enabled Giddens to develop an analytical framework structured around intertwined concepts of social structure and human interaction. Each concept is broken down into three dimensions, Thus interactions can be characterised by a focus on communication, or the exercise of power, or sanctioning. The corresponding structures are classified respectively as being for purposes of signification, domination or legitimation. These are linked by modalities. Thus human communication involves sense-making by use of interpretive schemes. These schemes reside within existing knowledge stocks. In that way human actors produce and reproduce structures of meaning, described by Giddens as structures of signification. In other words they are the structures from which meaning is developed. In the same way, structures of

legitimation underpin sanctioning or sanctioned interaction, and structures of domination underpin actions focused on the exercise of power.

Applying Giddens' analytical framework helps, therefore, to explain observations made in this thesis about both people and systems. Looking first at the actions of clinicians and managers, these were shown not to exist in a vacuum. Rather they were seen to have been shaped, to some extent, by what went before, by existing structures of signification, domination and legitimation, defining, for instance the theory and practice of medicine, and the representation of clinical reality purveyed by the statistical data sets. Thus the evidence has shown how individuals in both groups came to situations with 'structures', which informed how they made sense of situations and how they responded to them. The process Giddens so astutely describes can be viewed as an iterative cycle:

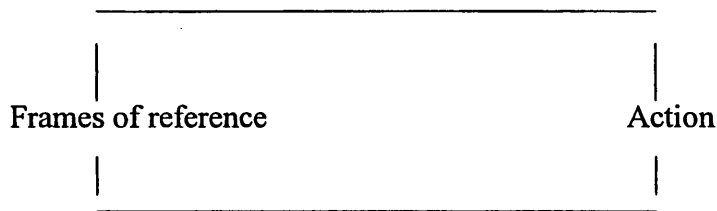


Figure 6, Giddens' Structuration Model, Adaptation 1

All models are simplifications of the complexity of the real world. However, therein lies one of their key strengths, in that by recognising their simplistic nature, we are prompted and enabled to explore that complexity further. Closer inspection of this cycle and its context indicates improved understanding of this key social process may benefit from explicit inclusion and consideration of the processes in play between the frames of reference and the resulting actions, namely the reflective process, which has been shown in this thesis to be reflection on selected data. That selection process is not random. It is informed by prevailing social structures. It is, therefore, a selection from any number of available realities. That selection is then endowed with meaning. This is drawn from existing structures, but this time in the form of individual frames of reference. These frames of reference are a mixture of individual characteristics and prevailing structural influences. This results in the production of either information,

which can be seen as confirming existing knowledge stocks, or of knowledge itself, which can be seen as adding to existing knowledge stocks, and may change prevailing structure.

Looking now at information systems, in the case of clinicians, the medical casenote is used to record some elements of their decision-making processes. Using the analytical scheme above, this document can now be reinterpreted as being deeply implicated in the modalities linking structure and action. It has been shown to be used to establish control, and it has been shown to encapsulate norms. Essentially, therefore, it is an active manifestation of the interpretive scheme of its authors. In other words it both reflects those schemes and, by its existence and use, reinforces them. This document can now be seen, therefore, to be a 'situated' creation of its author (Giddens, 1976: 63). In other words, its incomprehensibility and its use outside the clinical domain can be better understood in these terms.

Management behaviour can also be better explained using this approach. This has been shown to include use of scientific instruments of enquiry and data collection, and promulgation of a reality for which no basis has been found in the evidence presented. This behaviour can be explained when the notion of situated, mutually constituted structures is employed. Thus prevailing structures here are built on a belief in the scientific rigour of clinical work. This belief system is broadly sustained by the knowledge-creating context within which it sits. This situation has been shown to be produced partly by the actions of clinicians. Their action in presenting themselves as 'savants' etc. can now be interpreted as contributing to the structures influencing behaviour in non-clinical groups. Hence, when clinical data shows gross inconsistencies they are assumed to be an artifact of the collection system. This makes sense of action to 'clean' data. This not only helps to explain such actions, it also indicates the far-reaching and dangerously obscure effects of belief systems.

The evidence suggests this influence is a one-way process in the problem domain. This indicates a level of power being exercised by or accorded to clinical groups that does not prevail for non-clinical groups. Thus, where power allows, groups have been shown to work not only within their own domains, in terms of producing and reproducing structure, but also in a tangled web of cross-domain relationships.

The remaining information systems can also be reinterpreted, in the same way as the medical casenote. They too have been shown to embody the interpretive schemes of these non-clinical stakeholders, and by their existence and use, to reinforce them.

Thus the above model can be enhanced:

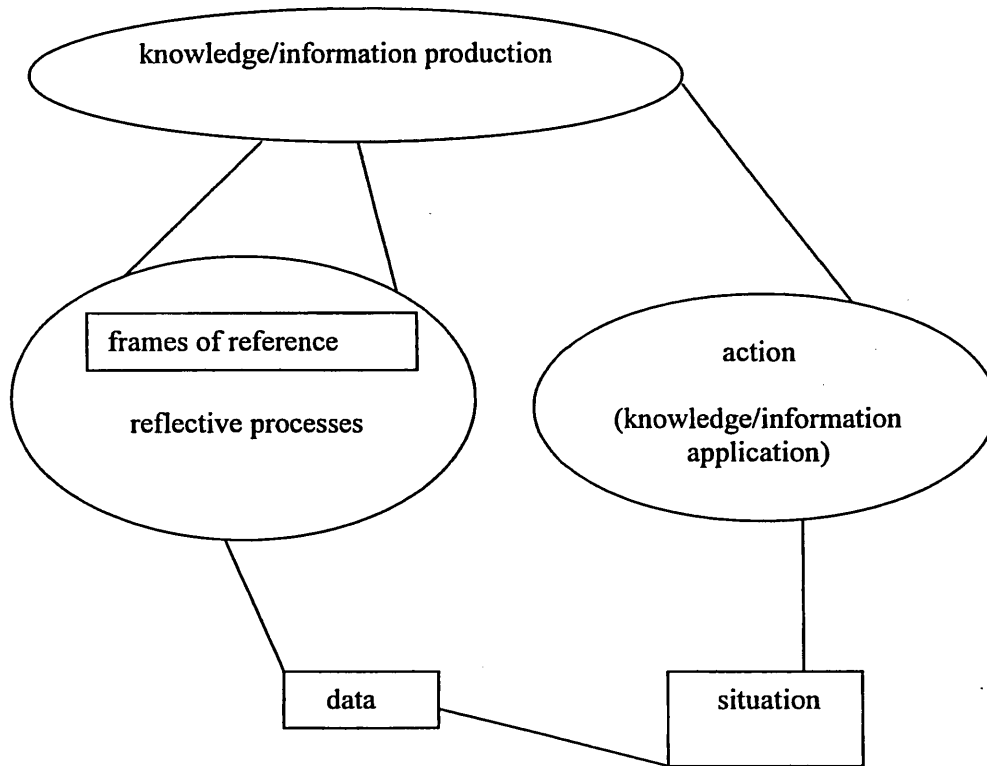


Figure 7, Giddens' Structuration Model, Adaptation 2

In this enhanced model, an individual's frame of reference is taken to include professional training, personal history and assumptions about past and/or current and/or future contexts. In the case of clinicians, they result in significance being attached to particular phenomena in the social world and also inform the nature and status of that significance. For instance, clinicians attach a 'tentative' status to much clinical knowledge, thus the significance of what they observe is uncertain. In other words their knowledge in these areas, and what can be known, is uncertain and remains so in the absence of additional and possibly different enquiry. A clear connection can then be seen in terms of the actions they take as a result of this structural context. These

include actions which are designed to reduce that uncertainty, albeit not usually to the extent of completely removing it. These actions, which can be seen to be part of a repeated pattern, in turn reinforce the 'structure' from which they were drawn. Managers, on the other hand, attach a status of fact to statistical data sets. As discussed above, this ossified knowledge assumes a host of characteristics not associated with its dynamic and tentative origins, and these in turn generate a different reaction than would otherwise have been the case. They both complement and reinforce both the interpretive scheme of the manager and the underlying structures of signification. This knowledge then legitimises decisions which amount to the exercise of power.

What has also been demonstrated by this thesis, as briefly referred to above and as explored by Giddens (1976) in focusing on the durability of social structures, is that the enduring repetition of such action can be seen to establish these orchestrated sets of actions as durable structures, in other words sets of actions that are repeated so often as to give them a 'thing' like existence. This does not disallow the notion of variance within even these structures, but accords it sufficiently low effect as not to disturb the overall 'structure', until and unless its effects become sufficiently powerful to result in change. This explains the practice of medicine as described in this thesis. Thus the social world benefits from analysis which recognises organisations as collectives of individual agents, and which also recognises that collective and individual actions are different in their effects. As noted by Cohen (1999) Giddens asserts that:

'... most groups exhibit two characteristic features enduring patterns of positions and relationships, characteristics, structural features (for example moral codes, types of domination, class structures).' (Cohen, 1999:282)

Structuration Theory (Giddens, 1976, 1984) has, therefore, enabled better sense to be made of the actions and systems described in the fieldwork, as they form the fabric of medical and management 'structures'. Examination of these actions also demonstrates the strengths and weakness of analytical models, which must tease apart essentially interlocked elements of human action. Thus, for instance, in the clinical domain investigatory actions draw on structures of signification. They also display the exercise of power and are facilitated within legitimating norms. Examinations and tests are, therefore, undertaken, which are sanctioned by the power of the profession and facilitated by its existing knowledge stocks. Similarly classifiable actions also include

those aimed at justification, justification being increasingly important as the opportunity for disagreement increases. Thus, some of those tests and examinations are designed to exclude, for instance, the presence of pathological cause. They also include actions based on low levels of significance being attached by clinicians to each other's information. As discussed in chapter 7, clinicians often disregard the details gathered by colleagues in favour of their own primary findings. Thus medical casenotes are idiosyncratic to the point sometimes of impenetrability.

10.2 Social Construction of Reality Extended: the Issue of Ontological Security

Staying at the level of the stakeholder groups, a further perspective on observed behaviours can be gained by consideration that both groups believe themselves to be dealing with the same universe of discourse. That two such fundamentally different 'realities' can emerge from what are apparently the same phenomena is an example, as discussed by Checkland and Holwell (1998) that different people may attribute different meanings to the same data, or different meanings at different times, because the agent is human not machine. This is not to say that social reality is a 'hotchpotch' of unique responses. Clearly social order exists. As argued by Layder (1994), these relatively 'independent' characteristics of individuals have an organic connection with wider social processes, hence 'social order'. Thus, it can be seen that subscribers to these beliefs are not passive. In their own ways each seeks to protect and promulgate their own preferences, worldviews and philosophies. Observed behaviour might, therefore, be explained in terms of what Giddens describes as the need for 'ontological security' (Giddens, 1984: 375).

Giddens (1984) describes ontological security as:

'Confidence and trust that the natural and social worlds are as they appear to be, including the basic existential parameters of self and social identity.' (Giddens, 1984: 375)

He elaborates on this as being the foundation upon which 'routine' rests, routinisation being claimed as a necessary element of human personality structure. For Giddens, in most circumstances of social life the sense of ontological security is routinely grounded in mutual knowledge employed such that the interaction is unproblematic or can be

largely taken for granted. In other words, as observed by Craib (1992) for Giddens social order exists because we are creatures of habit. Craib argues against this, maintaining that Giddens' approach amounts to primacy for the routine ways we construct institutions etc., rather than the routine ways we construct meanings.

It is useful at this point to return to the notion, discussed earlier, that all knowledge claims exist in the form we know them:

'.... In response to particular interests in prediction and control, which are in turn related to social interests.' (Barnes, 1977: 30)

and that interests, particularly robust ideological interests can lead to consideration of questions like:

'What account of reality would lead others to act so that instead of furthering their own interests they furthered ours?' (Barnes, 1977: 30)

What is being considered, therefore, is the extent to which observed behaviour was reflective of a need for ontological security pursued through ontological protectionism and ontological supremacy. Reconsideration of the context of these two groups is useful here.

It is no coincidence, and it was wholly predictable that the arena in which this is played out is what Mintzberg (1983: 191) refers to as a 'Professional Bureaucracy'. As discussed earlier, in Mintzberg's analysis this type of organisation is predominantly bureaucratic, in terms of approaches to organising core work. However, some standards referred to are generated not by the organisation, but by self-governing institutions residing outside the organisation and holding primacy in terms of professionals' loyalty. As discussed in the literature review, in the NHS the core work is characterised, at least at a macro level, by a reductionist, scientific approach. However, the external, clinical standard-setting body is the BMA. The support work is more characteristic of a machine bureaucracy, with professionals' support staff facilitating their work and performing as many of the 'routine' tasks as possible. This gives rise to an organisational form in conflict, wherein parallel hierarchies operate; one top-down with a commitment to a machine bureaucracy for support staff, wherein power comes from position, and one bottom-up and democratic for professionals,

wherein power comes from expertise. This phenomenon will be returned to later in discussion of what Giddens (1976, 1984) describes as 'structural conflict'. At this point, however, it can be seen as a situation, discussed earlier, where key groups are:

'.... thrown together and are forced to maintain themselves and their ideas in the face of the onslaught of heterogeneous groups.' (Mannheim, 1970:118)

In other words, it is arguable that this situation of conflict leads to behaviour oriented towards maintaining ontological freedom, or ontological protectionism, and possibly also to ontological imperialism, or the pursuit of ontological supremacy. Thus, to look at one of the two key groups under study, the Government's pursuit and promotion of their worldview by the promulgation of information based on ICD-10, OPCS-4 and HRGs might be considered in the context of an attempt to achieve ontological security by a kind of imperialist approach. As discussed by Bowker and Starr, these systems have been described as 'frozen organisational discourse' (1994: 187) in that they are reflective of the belief system, the values, opinions and philosophical commitments of their subscribers.

In summary so far, what has been observed can be perceived within the notion of outward manifestations or, to use a clinical analogy, symptoms of protection and furtherance of deep philosophical commitments which determine what is structured as 'reality'. What can also be perceived is something about how those structures emerge, some of the effects of their emergence and the implications of their emergence in terms of the kinds of conflict inherent in Mintzberg's model (1983:191) of the Professional Bureaucracy, and in Mannheim's (1970) work on the organisational implications of multiple occupational groups. What were of key interest to this thesis were the effects of these phenomena and situations on information transfer. Once again Giddens' work (1976, 1984) offers useful insights, this time with the concept he describes as 'structural contradiction' or 'conflict'.

10.3 Structural Contradiction and Conflict

Use of Giddens' concept of 'structural contradiction' or 'conflict' (1976, 1984) enabled analysis which embraced the organisational context as a whole. This concept refers

to an inconsistency in organising principles which manifests itself in eruptions of conflict along the fault lines. It is argued here that this should be taken explicitly to mean structuring of reality, as described above, and that manifestation of this discord can be found when action and interaction is seen in terms of what constitutes the 'structure' we refer to in describing organisational forms. Thus, as Giddens (1976) argues, Marx identified the central contradiction in structural principles as that between socialised production and private ownership. In other words, we produce collectively and are mutually interdependent in doing so, but what we produce is appropriated by private individuals. In the case of the NHS it might be argued that there is inherent structural contradiction manifest between the two key groups. On the one hand, there is the centralist, objectivist role, whose collective, financially and politically accountable responsibilities of administrators are reflected in their actions and informational behaviour. On the other hand, there is the professional, independent, individual-oriented role of the clinician and their consequent actions and informational behaviour.

Manifestations of this phenomenon include the information systems which are at the heart of this thesis. They each reflect the knowledge-creating contexts of their sponsors. Thus previous analyses of the medical casenote were supplemented with the notion that it is reflective of the power base originally agreed for clinicians. It serves their needs, not those of the wider organisation. Classifications similarly reflect a reified justification of the original decision that a service like the NHS could be controlled. Thus the original agreement is one which holds each key stakeholder group in constant conflict, which is manifested and maintained by the systems in use. Hence, the total lack of exchange of meaningful information between two groups with different agendas, whose information systems are so deeply implicated in pursuit of those agendas. To return to Figure 4:

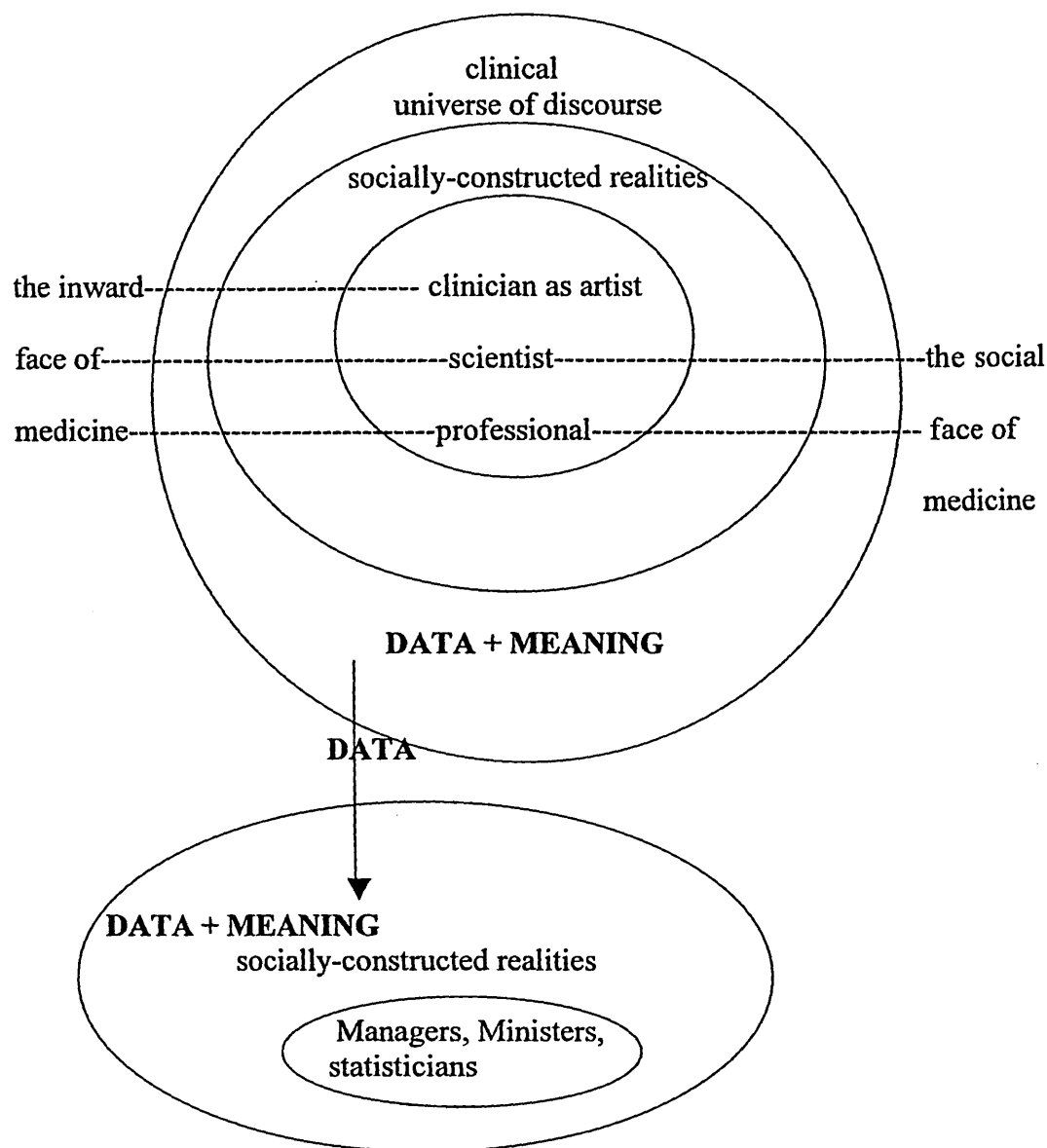


Figure 8, Two Domains Revisited

The original aims of the research were to better understand the nature and validity of data underpinning key social processes, namely in the area of healthcare and, broadly, to do this by exploring the issues surrounding transfer of clinical knowledge and information from its origins with the clinician, through various transformation points, to its emergence as healthcare statistics. As figure 8 shows, this importantly reveals that *transfer*, the passing on in essentially unchanged form, of clinical knowledge or information is not occurring. What exists are systems which allow the extraction of pure *data* by the non-clinical groups from the clinical domain, which is turned into

information by the application of *meaning* reflective of the non-clinical domain. This represents construction of a new and different reality, again reflective of the frame of reference of the non-clinical domain and not reflective of the clinical reality it purports to represent. This data transfer is done without debate and with little discussion. Where discussion occurs conflict, in the form of complete lack of mutual understanding, results. The systems are, therefore, consistent with the political structures of their sponsors, but inconsistent with each other and with any notion of a unitary organisation. They reflect and maintain a situation where the relationship between the key groups is one of duress.

This observation led the analysis to further exploration of a different dimension of the problem domain, that of relationships, and to use of some of the insights offered by ANT.

10.4 Actor Network Theory

ANT (Callon, 1986, 1997; Law et al, 1989; Latour 1989, 1991, 1997, 1998) is argued as offering only limited analysis of either wider or more local social structures. Nor is it a theory (Callon, 1997). It does not, therefore, provide a coherent explanatory principle. It does, however, focus on how things get done, and explores this by analysis of the creation and maintenance of coextensive networks of human and non-human elements. Hence, its use in combination with Structuration Theory in the context of this research, and given findings thus far, was considered useful.

The approach used in ANT began with an initial concern with the sociology of science (Callon, 1986, Latour, 1987) which grew into exploration of technology and information technology (Latour 1996a and 1996b). As discussed by Callon (1997) ANT in part focuses on:

‘ the role of technical devices and scientific skills in the performing of the collective.’ (Callon, 1997: 12)

In the case of information systems these include people, organisations, software, computer and communications hardware and infrastructure standards. As further noted

by Callon (1997):

‘ANT was developed to analyse situations in which it is difficult to separate humans and non-humans, and in which the actors have variable forms and competencies.’ (Callon, 1997: 3)

The particular contribution of ANT to this thesis was in its focus on the network of relationships which operate between individuals and groups, and the notion that the ‘social’ world results from successful networks of aligned interests, which are created by enrolment of sufficient allies. This is achieved by translation of their interests so that they are willing to participate in particular ways of thinking and acting which will maintain the network. Together with Structuration Theory (Giddens, 1976, 1984) this helped to further explain the nature and practice of the clinical and management professions. Its focus on relationships also resulted in reconsideration of the apparent lack of relationship between the two groups.

In terms of clinicians the evidence has shown that, in order to protect the current status and practice of medicine, to general society they must cloak their work in the mantle of science and mask those unscientific characteristics. Thus clinical groups have successfully enrolled management as allies, by colluding in a representation of their work which encourages the management practice of wide promulgation of data, which then reinforces consequent social perceptions of medicine. Clinicians, therefore, actively sustain a representation of clinical work which constitutes its socially accepted structure, and thereby protect their social position. They also, however, work within a substantially different structure, which supports notions of pursuit of ontological security, as discussed above. This insight revealed action and structure as pluralistic and not unitary. This supports the notion of the *knowing* or reflexive subject, and disproves assertions of action being fully determined by structure.

Both domains may now be interpreted as existing as a result of successful achievement of networks of aligned interests, which were created and are maintained by enrolment of sufficient allies. This is achieved, for instance, by Ministers by perpetuating a representation of the NHS and of their role in achieving its effectiveness and efficiency, to the extent that they are willing to participate in those ways of thinking, and the actions which follow, and thereby maintain the network. Clinicians’ success is in part

at least the result of expert power, which has been shown to manipulate wider society to its own ends. In both domains action can now be seen not as purely pragmatic, or misguided, but as an active attempt to enrol allies which will enable socially constructed contexts to be perpetuated. What is also now apparent is that, although pure data flowed between the two domains, allowing meaning to be situationally created, a second, informal flow existed as part of this network, which informed non-clinicians that clinicians were engaged in scientific activity and enrolled them in that view.

This analysis was further enhanced by ANT's insights into non-human resources, which in this theory include computers systems and software (Bowker and Starr, 1994). These are recognised as inherent parts of these networks because they are not seen as passive. They are seen also to exert influence by standing in or speaking for particular viewpoints which have been inscribed in them. This is consistent with Bowker and Starr's description of computer software as 'frozen organisational discourse' (Bowker and Starr, 1994: 187). Where these delegates are robust and resistant to change they are known as 'immutable mobiles' and viewed as taking interaction to a point where it is no longer possible to return to a point where alternatives exist. To that extent they fix certain elements of relationships in any related network. They also significantly strengthen them. This helps to explain findings from the research which gave every indication of permanence to both the classifications and the behaviours which surrounded them. They can also be explained by Barnes' (1977) observation that:

'Often (invalid) descriptions are the product of social interests which make it advantageous to misrepresent reality, or social restrictions upon the investigation of reality, which make accurate perception of it impossible.' (Barnes, 1977: 1)

ANT enabled, therefore, a fuller appreciation of the problem context, by suggesting and supporting exploration of both the superstructure and relevant actions, and the tensions and dependencies existing among and between groups, and also by enabling deeper understanding of the formal and informal relationships and flows between them.

Chapter 11, Final Conclusions, Implications and Recommendations

In this chapter the final conclusions and implications of this thesis are discussed. Also discussed are recommendations for further work. As clinical knowledge, data and information formed the vehicle for this thesis, the discussion focuses first on the area of healthcare practice and management. It then broadens to a more general level.

In making these conclusions and recommendations, a number of things are recognised. Firstly, the problem as perceived has not been 'solved'. Such a concept was considered inappropriate to research which sought, instead, to advance knowledge in this area. Secondly, many of the findings reflect issues with deep-seated sociological causes. It is recognised, therefore, that ability amongst practitioners and key stakeholders to make changes at that level would be limited and success would be slow. This is because the changes implied by such issues are both behavioural and wide-ranging. They are also highly contingent. This does not, however, invalidate them, for two reasons. Firstly, what could be achieved much more quickly, and with great affect, is awareness among practitioners that such factors exist, awareness of the likely causes, and more informed practice as a result. Also, recommendations can be made which relate to current issues, including those involving long-term investments, which can have even longer-term effects. Deep exploration of the recommendations, in terms of detailed implementation issues would be the subject of a further piece of work. They are, therefore, presented in a relatively brief format here. However, even at this level, together with the evidence presented in this thesis, they have the potential to influence important perceptions among key groups. This alone would be an important first step in achieving the kinds of wider social changes suggested.

11.1 Conclusions for Healthcare Practice and Management

This research began by asking the following questions:

- Is there an objectivity inherent in clinical data?
- Can it be so readily translated into the body of statistical fact that underpins the data sets for healthcare decision-making?
- What is the relationship between the social knowledge processes involved in clinical decision-making and the nature of data produced from those actions?
- What is the impact on decision-making in healthcare management?

Taking the notion of objectivity to mean that about which there are high levels of consensus, as discussed in chapter 3, the findings have shown that clinical work produces a mixed assemblage of highly subjective and more objective data. Evidence also demonstrated that, because of this heterogeneity, an irregular relationship exists between clinical data and its statistical counterpart. In this way it was demonstrated that all clinical data can technically be readily translated into the body of statistical fact which underpins healthcare decision-making. However, it was also demonstrated that accurate technical performance does not necessarily equate to transfer of knowledge. Rather this process gives a partly illusory and misleading representation, which confirms the socially-held perception of clinical work. This results in and from situational realities. Ability to translate such data in such a way as to transfer such knowledge across social boundaries, without disturbing meaning has, therefore, been shown to be questionable.

This was shown to be caused as a result of enactment by clinical and non-clinical groups of their respective social contexts. These can be defined as knowledge-creating contexts which determine how data might be both produced and also how it might be validly used in decision-making, both within and outside the domain of clinical work. These enactments were shown to be mutually constitutive of action and structure, both within and between groups.

Clinical enactment both created the clinical view of reality clinically sought, and also colluded in that sought by non-clinicians. Creation of this latter view was shown to have a foundation both in clinical behaviour towards general society and, at the initial stages of data transfer, through the medical casenote. At this point construction through

the data of an alternative model of the clinical reality experienced began. Non-clinical groups imposed their own model, based on their own very different frames of reference and assumptions about clinical work. These non-clinical models reflected those factors rather than any direct interaction with clinical reality itself.

Models created in this way were shown to give the appearance of control over their area of reality because they defined and, in that sense, created it. Belief in them generated behaviour which perpetuated those realities, and which, aimed as it is in this case at healthcare decision-making up to policy level, has widely-known and far-reaching effects.

This thesis has demonstrated, therefore, that, as noted by Blackler (1995):

‘.... knowledge is multifaceted and complex, being both situated and abstract, implicit and explicit, distributed and individual, physical and mental, developing and static, verbal and encoded.’ (Blackler, 1995, in Scarborough et al, 1999: 34)

It has also shown medical practice to be an area where formalisation of that knowledge is inherently problematic, due to a range of social factors. As noted by Clancey:

‘.... medical practice is inherently unformalizable and truth-constructing, and that doesn’t fit with the objectivist view of classic science.’ (Clancey, 1995: 8)

Turning now to the last research question, the impacts of these findings on decision-making in healthcare are significant. As things currently stand, this knowledge underpins key final outputs, which at present include hospital management data and government statistics about healthcare. They will increasingly also include data upon which clinical decisions are made. In that context this knowledge has been shown to perpetuate structures and actions which are misconceived. To argue that decisions made in this context are irrational would be inaccurate. As discussed by Dreyfus et al (1986) the term ‘rational’ may be defined as that which can be explained based on valid explanation, where the elements of a situation can be identified and combined by a decision rule in order to justify a particular decision. Thus, NHS managers might argue that it is rational to close one of two intensive care facilities because the data shows that

levels of conditions treated by them only justify one. Such decisions have rationality in that they are the result of calculative thought. However, it is misguided rationality, as an unknown quantity of the data on which it is based is fabricated. The research found, therefore, that NHS healthcare policies displayed fundamentally flawed rationality.

In terms of whether this matters and whether it works, in one sense it does. The NHS continues from day to day and patients are treated. However, if this is done, and the evidence presented suggests it is, on the assumption that policies are based on knowledge of clinical reality as experienced by patients and clinicians, it must now be argued that this assumption is incorrect. The model which the DH use has been shown to be too far removed from that which they assume, and the primary DH relationship is not with that assumed reality but with that constructed by, and from, and with the data, and the methods and assumptions applied to it. These findings raise, therefore, serious questions about the validity of healthcare statistics, and the wide range of governmental strategic decision-making.

11.2 Implications and Recommendations for Healthcare Practice and Management

If this situation is to improve, the implications of these findings for the NHS are momentous and would affect all organisational groups explored in this research. An informed response would require a fundamental reappraisal of the vast range of decisions and systems which rely on the transference of clinical knowledge across functional boundaries, and of its use in different knowledge domains. Such decisions include policy development, determination of how much taxpayers' money should be spent on healthcare, funding allocation, and systems investments.

Addressing these issues clearly has implications for the current structural arrangements in the NHS. As this thesis has demonstrated, 'structure' is a manifestation of personal and informational behaviour. If these arrangements persist, the problems identified in this thesis can be expected to also. Thus the situation where clinicians have no formal corporate responsibility and managers have no management responsibility which is

inextricably linked to the core work of the business, must be reappraised. Part of this would involve establishing a currently missing link between the meaning of data and its purpose. In other words, a method of doing business must be found where it is not possible to disregard whether a bone marrow transplant is coded as a kidney transplant, and where a clinical conjecture about the source of pain cannot be coded as kidney stones. This would help overcome the current situation where each key stakeholder group can be ignorant of the realities and problems of the other. This is not unavoidable, and small examples of more successful approaches exist, which range from the supportive and positive to the punitive. An example of a supportive approach was found in a clinical department which adopted a more organic method of management. Here a manager was employed specifically as a boundary-spanning liaison between the department's clinical needs and those of hospital management. This person was a manager, but employed by the clinical department. This had been highly successful, as trust was developed by both clinical and managerial groups that a fair and balanced process of mutual understanding and negotiation was taking place. A more punitive approach is the US hospital which withdrew admitting privileges to physicians who did not complete high quality clinical documentation about patients in a given timescale. Clearly, these are small-scale examples, and the US case exists within a very different context to that of the NHS. However, current principles of organising in the NHS have been shown to be one result of circumstances and not, therefore, the only ones possible.

Such a change in the value of information to the NHS would, in turn, support an equally necessary change in the attitudes of both professional and non-professional staff to each other. As long as existing attitudes persist substantial change will not occur in the existing situation. It would also have implications for the nature of all staff handling clinical coding and data, and the training and career infrastructures surrounding them. More informed behaviour in this area would require a different level of expertise among relevant staff, and concomitant rewards.

There are also implications for systems, which would also have effects on those involved in them. Systems here include coding schemes and automated coding

systems. The former are the backbone of NHS data flows and, as the electronic health and electronic patient record begins to become a reality, the latter will grow in importance. Given this situation, there would be a need to move away from the current situation where:

‘.... development of formal vocabularies moves about in its own world of formalism. Now that many groups have developed competing vocabularies, the problem has been transformed to *formally relating formal descriptions*. The original problem faced by a medical practitioner of *producing* good descriptions and *interpreting* past work are lost. To the vocabulary enthusiast we need only produce finer-grained vocabularies and all will be complete and rational.’ (Clancey, 1995: 8-9)

As this thesis has shown, there is no way to completely record subjective experiences and events. All coding requires abstraction from experience and interpretation of terminology. All coding means that the primary information and its context are necessarily left out. As noted by Shariq (1991) knowledge transfer is ultimately a human-to-human process. Even in this type of transfer, since this process is inherently interactive and dynamic, the knowledge, in essence, transforms while or during the very process of its transfer. Herein lies the dilemma. In an increasingly electronic environment, coded, computerised clinical data is essential. This is the case not only for management, if any notion of efficiency, effectiveness and equity, all of which are apparently aspired to, is to permeate the NHS as a whole. It is also essential for clinical purposes. Bowker and Starr (1994) following their analysis of the ICD for mortality purposes, suggest a way forward which recognises the inherent tension in this need, but also demonstrates the size of the task implied:

‘It is unrealistic and counter-productive to try to destroy all uncertainty and ambiguity in these sorts of infrastructural tools. Rather than root out all instances of ambiguity, analysts of standardised lists should instead seek clearly and consistently to define the degree of ambiguity that is appropriate to the object in question.’ (Bowker and Starr, 1994: 207)

They do not offer any practical suggestions about how this might be done, and indeed it could be argued that the degree of definition suggested assumes a constancy in clinical reality which was not observed during the research. The problem in this approach is echoed by Davenport and Prusak (1998) who assert that:

‘The challenge is to codify knowledge and still leave its distinctive attributes intact, putting in place coding structures that can change as rapidly and as flexibly as the knowledge itself.’ (Davenport and Prusak, 1998: 87)

However, there is at least a recognition of the inadequacy of such tools, which is the foundation for change. A similar recognition was found in Law’s comments. His concern is more focused on the need for and effects of labelling:

‘Naming does work. It does analytical work. But it also does political work Labelling strains to perform simplicity. It pushes towards singularity. It tends to make relative fixity. And it helps to perform the possibility of unsituated transportability.’ (Law, 1997: 9)

However, as he goes on to note, this should not deter consideration of:

‘.... how to talk about something, how to name it without reducing it to the homogeneity and fixity of singularity’ (Law, 1997: 10)

Clancey (1995) perhaps offers a practical way forward:

‘We must focus on the practice of how people use descriptions, perhaps augmenting them by informal representations (e.g. free text, photos, video, sound recordings) and ensuring that meaning can be reconstructed collaboratively.’ (Clancey, 1995: 8-9)

Thus what Clancey is suggesting is a move away from the assumption that any one type of system can capture the complexity that is clinical knowledge, towards an improved situation where multiple input and output types are employed. This has some precedence already, in prototype clinical systems, which at the time of this research were aimed purely at delivery of clinical work, and which combined such multi-media and format presentations. This demonstrates a positive move at the clinical level, the wider relevance of which will unfold in due course.

This would inevitably, however, have implications for the data which Government could extract from the NHS, and its belief in the notion that the NHS is being accurately controlled by current methods, or indeed that it can ever be controlled to that extent. It would require a shift from the image currently projected that fairly complete

and concrete information about the use of public money is held, to a realistic account and realistic plans. This sea-change has no precedence in Government behaviour and the motivation to do it, while critical, is not assumed.

Given the implications discussed above, it is recommended, therefore, that further work is undertaken in this area, which involves clinicians and non-clinical stakeholders, to fundamentally realign traditional notions of which clinical knowledge can reliably be computer coded, and that findings from this work find expression in the clinical systems, statistical datasets and decisions of the future. It is recommended that the models developed in this thesis be employed in this work. This will further test those models and thesis findings. It is also recommended that findings from further work reshape and refocus the enormous efforts directed towards measuring and achieving quality in the area of coded clinical data, so that the NHS becomes a learning organisation, rather than one caught in its own history (Stinchcombe, 1965).

In making the above recommendations, account is taken of reflections made by Davenport and Prusak (1998). The process in which clinical and non-clinical groups would engage in undertaking such recommendations would be one of knowledge sharing and creation. In that circumstance a shared language is essential:

‘Research has shown time and time again that a shared language is essential to productive knowledge transfer. Without it individuals will neither understand nor trust one another. Brought together they will simply clash and not connect.’ (Davenport and Prusak, 1998: 98)

Thus it is also recommended that individuals with boundary spanning abilities would be a key group to the process suggested. These individuals would translate between cultures and value systems, and thereby make knowledge creation and sharing easier. Future work might usefully focus on a methodological approach such individuals might employ. It is suggested, therefore, that this thesis could usefully have practical implications, in that it could be used to develop guidance for a range of practitioners, including those in the fields of management, IS and OT, and other key stakeholder groups, which was based on recognition of the findings of this research and on

addressing the range of issues thus entailed in managing and implementing change of this type.

Response to the significant challenge this would represent for the NHS would need to be driven from the highest levels. As discussed earlier, the factors leading to the current situation have multiple, sometimes deep-seated sociological foundations. They would involve all key stakeholder groups: clinicians, coders, managers, statisticians and Ministers. They would also directly affect the general public. Given that situation, the changes suggested would require significant power in order to see them through.

Structure has already been discussed in terms of organisational players. However, this is also an issue for the above-mentioned practitioners involved in facilitating any change. The systems needed would not be for the organisation or 'structures' of today.

The challenges are, therefore, substantial. However, the rewards for all involved could be equally so:

'.... the ability to analyse the different types of knowledge deployed by the organisation (are they embedded in organisational routines, in technology, or in people, and what are the transfer processes between these modal types?) and to relate such knowledge to issues of organisational design, career patterns and employment security, would provide an interpretive resource of greater value than the simplistic, cognitive paradigm that emerges from much of the existing literature Understanding can in turn inform practice in that the awareness of different forms of knowledge and their contribution to the organisation can help to shift the debate from the level of epistemology to a much more grounded and firm-specific discussion centred on corporate strategy.' (Scarborough et al, 1999: 51)

11.3 General Conclusions and Recommendations

The apparent leap in this thesis from a constructivist view of information: that it is part of social interaction and structures, etc, to a structuralist view, was shown not to be the product of the thesis or the approach taken to the research. Rather, it was a unique discovery of this research that this dichotomy exists in reality. The dynamic nature of the emergence of knowledge, and the way it is sometimes ossified, e.g. through ICD-10, generates a different reaction than would otherwise have been the case. Thus,

ossified knowledge was shown to assume characteristics not associated with its dynamic origins, and to lead to behaviour that would otherwise not have occurred.

These findings have a number of major and more generalisable implications. At one level they promote caution, both in terms of untested assumptions about social domains and also, therefore, in terms of the use of data associated with those domains. At a more fundamental level, however, key amongst the implications is the issue that, in order for more informed consideration to be given to transfer of knowledge via any medium, and in any setting, particularly where unstructured, highly qualitative areas are addressed, it is first necessary to challenge socially accepted assumptions about the nature of the knowledge involved and its relevance and relationship to any subsequent modelling methods, techniques and decisions. It has been shown that, whatever the reasons which precipitate such action, it is simply inadequate to apply scientific, machine models to knowledge areas of this type. This thesis demonstrates that these models have application, but also that they singularly fail to recognise complex realities, not least because they fail both to take responsibility for the informational content of what they address, and to recognise information as a fundamentally human phenomena.

In final conclusion, and to return now, on the basis of the evidence presented, to a basic premise of this thesis, its findings call also for further work in a number of areas.

The implications of the findings reported in this thesis are significant. It is, therefore, recommended that they are also tested outside the sphere of healthcare. The ontological position assumed in this thesis rejects the notion of 'truth' that can be known independently of the values, interests and purposes of the enquirer. It engages in:

‘.... knowledge making as a human activity (which produces) sufficient compelling evidence in order to persuade one another of the value or goodness of a way of thinking.’ (Schwandt, 1993: 19-20)

Validation of the findings in this thesis rests, therefore on two factors. The first is contained within the thesis and involves the extent to which the underlying assumptions

on which the arguments and stances are built have been exposed and bear scrutiny. This level of validation requires no new work to be undertaken. The second involves the extent to which this thesis has produced knowledge worth acting on. In order to determine this it is recommended that further work is undertaken which tests the strength of the relationship between the key theories, concepts and domain models which have been established and other, different, real world social contexts.

Also, this thesis asserts the value of a transdisciplinary exploration of knowledge, data and information. It also asserts the importance of exploring these phenomena in-situ. It is recommended that work is undertaken, which may include any of that discussed here, that tests these approaches.

Drawing now on specific findings from the thesis, two further recommendations for future work are made. Firstly, it is recommended that work is undertaken to fundamentally reassesses the types of knowledge being handled in systems generally and the way those types are handled. It is recommended that it should provide either conclusive evidence to support the notion that machines which can handle those levels and types of complexity can be found or, if not, for a methodological framework for more sensitive application of 'scientific' systems, which recognises the limitations of the paradigm.

Secondly, there is an increasing reliance on a knowledge-based economy and the need for learning organisations to underpin that. It is recommended, therefore, that the models and findings developed in this thesis are used to develop the above-mentioned notion of exploring the types of knowledge that can be reliably computer-coded into a more powerful theory of Knowledge Management. In other words, it is recommended that this thesis and the research on which it is based is used as a platform for achieving organisations and systems driven by knowledge rather than data. This has the potential to improve the quality of our actions in response to situations, reinstating the 'knowledge' we appear to have lost in the phenomenon that is 'information' (Eliot, 1963).

Chapter 12, Contribution of the Research to the Literature

This chapter describes the contributions made by this research to a number of areas of literature. Contributions to specific areas are discussed first, and followed by contributions of a more general nature.

A range of contributions are discussed within this chapter, some of which may seem insignificant. However, in relatively young fields, for instance Medical Informatics and Knowledge Management, it seems appropriate at this stage to include them, as some may be seminal. Further research would determine this and, therefore, the relative importance of other contributions. Thus, while a summary table of key contributions can be helpful where such a range is discussed, for these reasons that presentational approach is not used here. The presentation of this chapter thus seeks to be coherent rather than to give any notion of significance.

Specific areas of contribution were considered to be The Sociology of Knowledge, and within that ANT (Callon, 1986, 1997; Law, 1987; Latour, 1996a, 1996b) the Sociology of Scientific Knowledge; Knowledge Management and within that AI; Information Systems, Organisational Theory and Medical Informatics; and Healthcare Management.

This thesis claims to have also contributed on a more general level by providing an innovative combination and application of cross-disciplinary bodies of work.

12.1 Contributions to the Sociology of Knowledge

A contribution has been made to the Sociology of Knowledge, particularly as it is explored through Structuration Theory (Giddens (1976, 1984). As discussed earlier, this is an abstract, heuristic, meta-level theory which explicitly excludes explanatory or descriptive application to real-world situations and stops at the level of meta-analysis. However, theory comes from iterative engagement with reality, and in order to claim validity must demonstrate its ability to offer explanatory insights to real life situations. Application of this theory to the research problem has, therefore, strengthened its claim

to validity. By adding this practical dimension, it should also have made it more accessible to other researchers.

A specific example of this was development, by application to the real-life context of the research problem, of the model underpinning this theory so that it includes consideration of the processes in play between different frames of reference and the resulting actions. These were namely the reflective processes, which engage with consciously selected data, which is endowed with meaning. This meaning is drawn from existing structures, including individual frames of reference.

A second specific example addressed the argument that its meta-level, abstract focus means that this theory fails to address the material world of information systems in any substantial way at all. This theory and its analytical framework represent a theoretical view which claims that systems embody interpretive schemes, norms and controlling facilities. As noted by Walsham (1993):

‘They are thus deeply implicated in the modalities that link social action and structure, and are drawn on in interaction, thus reinforcing or changing social structures of signification, domination and legitimation.’ (Walsham, 1993: 64)

However, this theoretical view was shown to be sufficiently well-developed to enable its successful application during the research to explore coding and computer systems. The implications for associated action and structure were also articulated. Thus it was both a conclusion of this thesis and a contribution to work in knowledge areas generally that knowledge which is ossified by systems assumes a host of characteristics not associated with its dynamic origins, and also has a defining influence on consequent behaviour.

Building on the social aspects of this contribution, the thesis also provides case study evidence of the effects of social location and characteristics on informational behaviour, and thereby again provides real life examples of the theoretical notion of structural contradiction and conflict (Giddens, 1976, 1984). It also, importantly describes not only effects, but also causes, thereby enabling recommendations for alternative action.

This enabled demonstration in the thesis of the necessity to take analysis into more detailed exploration of systems and relationships, in order to fully appreciate what is happening and why in a problem domain. Thus the thesis provides an added richness to this theory by demonstrating that structure and action do not happen only in unitary environments. In the case of clinicians some actions were aimed at promoting the scientific structure of medicine, while others operated within clinically accepted structures.

This observation led to a contribution in a second area of work within the Sociology of Knowledge, ANT (Callon, 1986, 1997; Law et al, 1989; Latour 1989, 1991, 1997, 1998). The contribution to which use of this work led involved the fact that ANT fits into social construction of technology (Bijker, Hughes and Pinch, 1987) and recognises that there are social consequences of technological choice, as well as reasons for it. The argument is that computers are increasingly undertaking tasks that were the domain of human intelligence, so the boundaries between the two are blurring. Latour (1996b) comments that:

‘It is no longer clear if a computer system is a limited form of organisation or if an organisation is an expanded form of computer system The two ... are now coextensive.’ (Latour, 1996b: 302)

He also argues that the two are inseparable. The heart of this approach is, therefore, complementary to that of Giddens discussed above, in that it encompasses recognition of technological systems as embodying social phenomena, in principal in same way as humans do. Where ANT makes a new contribution is in its approach to analysis of this phenomenon. Key dimensions of analysis include the notion of trying to trace and explain the processes whereby relatively stable networks of aligned interests are created and maintained through human and non-human agents. This analysis includes as central, therefore, people, organisations, software, computer and communications hardware and infrastructure standards. These elements were also central to the analysis of the problem explored in this thesis. People and systems were shown to be intrinsically linked, with systems being reflective of frames of reference, which included how the problems faced were framed and what measures were taken to address them. The thesis also shows how clinical and managerial behaviour could be interpreted as aimed towards sustaining networks of aligned interests, which each

actively manipulated for their own ends. However, the thesis also contributes to this work in that it has also shown that the systems employed in this process are only a more visible manifestation of this issue. It asserts that all systems and choices about systems, whether computerised or manual, reflect human values and social characteristics. The thesis also shows that this is not as a result of a recent blurring of boundaries. Rather, this has long been the case, but these boundaries and the nature and effects of systems have been misunderstood. That ANT has arisen at this time is more likely to be reflective of the fact that technology is playing an increasingly large role in our lives. Effects have therefore become more acute, but the basic problem is of longer standing.

A further contribution has been made by demonstrating that understanding of broader social structures is an essential part of network analysis. These influence local structures and these include networks and collectivities of actors. In this sense, ANT seems to militate somewhat against the overall thrust of Giddens' work, by overlooking the notion that the way things get done is part of a mutually constitutive process between action and structure. Supporters of ANT argue this is not the case:

‘.... The macro-structure of society is made of the same stuff as the micro-structure.’ (Latour, 1991:118)

They also argue that the methodological aspects of ANT can be used to move between the two. Firstly, some definition of what the ‘stuff’ referred to, and of macro and micro, is necessary to support this claim. Secondly, a contribution of this thesis is to demonstrate that it depends on the macro and micro-structures. The macro structures of the NHS and Government have been shown to have little effect, or at least little intended effect, on the micro-structure of its clinical workforce. ANT might, therefore, now be seen to overlook conflict of this type and at this level. A contribution of this thesis, therefore, is to demonstrate that use of the concepts in both this and Structuration Theory (Giddens, 1976, 1984) provide a more fine-grained analysis than would otherwise result.

A further contribution revolves around the notions of mutability and immutability, which this thesis has demonstrated could be better defined by ANT. ANT argues for the existence of immutable systems, which once established offer no possibility of

returning to a position where alternatives might be considered. On the surface this militates somewhat against the notion of 'social' systems and mutability inherent in Giddens' work (1976, 1984). As discussed by Walsham and Han (1991):

'The model of human agency in the theory views human beings as monitoring their conduct and its results in a reflexive way which together with an emphasis on the inevitability of unintended consequences of intentional human conduct, implies that all action carries within it the seeds of change; thus all action can transform as well as reproduce existing structure.' (Walsham and Han, 1991: 77)

However, there is also a temporal dimension which is not well articulated in ANT and was not the subject of this thesis, but which cannot be assumed. Structuration Theory allows for a temporal dimension, although it does not explore this in detail. It does assert that social practices are not fixed for all time, rather they are perceived to be mutable, and developing and changing in different ways in different times. The many consequences of social practices are, therefore, beyond being fully predictable or controllable in advance. As currently expressed, ANT does not explore this kind of dynamic. This is important because it demonstrates one aspect of humans and non-humans which means they cannot be successfully analysed in the same way, as ANT would suggest. Knowledge and values were shown in this thesis to become ossified in the systems studied. Thus notions of mutual constitution were much less dynamic, although the effects of the systems on larger social structures and action was constant.

12.2 Contribution to the Sociology of Scientific Knowledge

A contribution by this thesis to this area of work was achieved by its exploration of numbers. It has demonstrated that, as noted by Handy:

'Numbers are often the quantified expression of an opinion.' Handy, 1985: 341)

This thesis describes an innovative and practical demonstration of this process in the field of healthcare statistics. It also identifies and analyses both the causes and the effects associated with this.

A contribution in this area was also made by revealing medicine to be an art as well

as a science. This suggests that the traditionally held view of medicine as purely scientific endeavour could usefully be adjusted. Also the link that this thesis has drawn between clinicians' knowledge-creating processes and associated data indicates that widely held perceptions of that might also be adjusted. The thesis has shown that social construction is endemic in knowledge-creation, even in this apparently scientific field. It has also shown that the objective and factual status attaching to data produced in this way is equally a product of socially-defined activities. Even 'objective' measures have been shown to have a subjective element. For instance, taking a blood pressure depends upon myriad human attributes, so that only physically measurable objects are not subject to this. This suggests a contribution of interest in both this field and that of philosophy, which is that the homogeneous concepts of subjectivity and objectivity might usefully be stratified or further qualified in order to better reflect that to which they refer. It also suggests that the concept of 'objectivity' might justifiably be accorded no greater weight or deeper meaning than knowledge which follows from the available evidence, has been produced in accordance with current scientific practice, and accepted as such into a community. The notion of an ultimate 'truth' then becomes irrelevant and the inherent fallibility of knowledge creation is admitted.

12.3 Contributions to Knowledge Management

Contributions to this field are discussed here because they draw on concepts in the previous areas and also draw on and have relevance to those which follow.

Review of this area began promisingly, with Knapp's (1998) observations about where the links between KM and industry were strongest. She asserts that foremost in these terms is the services sector, especially professional services firms, for which knowledge was the primary asset:

'Knowledge Management (and the learning organisation) represent important new approaches to the problems of competitiveness and innovation confronting organisations KM is focused on the ways in which firms facing highly turbulent environments can mobilise their knowledge base (or knowledge assets) in order to ensure continuous innovation in projects.' (Scarborough et al, 1999: 2)

Drew (1996) comments similarly:

‘KM has an emphasis on relative competitive performance...’(Drew, 1996: 3)

KM focuses, therefore, on knowledge resources as ‘core competencies’ (Prahalad and Hamell, 1990) or ‘routines’ (Nelson and Winter, 1982) ‘capabilities’ (Collis, 1991) and ‘core skills’ (Klein et al, 1991). Prahalad and Hamell(1990) discuss these resources as:

‘.... the well-spring of future product development the roots of competitiveness, and individual products and services are the fruit.’ (Prahalad and Hamell, 1990: 202)

Clearly then, the notion of managing knowledge has been driven by the search for increasingly effective ways of achieving and maintaining competitive commercial advantage. This was not necessarily problematic, as it was hoped that insights into the nature of knowledge would be such that findings were applicable in an organisation such as the NHS, which is non-profit-making, and where competition has been minimised to the point of non-existence for practical purposes. However, further exploration revealed a relatively narrow emphasis in this work and a number of other features of KM indicated the relative poverty of this field in relation to this research. KM was found to be dominated by:

‘.... a rather narrow IS perspective KM is primarily IS/IT driven.’ (Scarborough et al, 1999: 27)

Scarborough et al (1999) also noted that IT is seen as a key enabler to KM. Moreover, as noted by Gardner, its aim is to ‘mine’ the tacit knowledge, skills and expertise of people:

‘KM is equated to data mining, digging and drilling.’ (Gardner, 1998: 24)

‘ the idea behind KM is to stockpile workers’ knowledge and make it accessible to others via a searchable application.’ (Cole-Gromolski, 1997: 6)

A review of the KM literature indicated, therefore, that it is characterised by a scientific approach to knowledge and knowledge transfer, which is reminiscent of that discussed in literature on AI and Computer Science. As noted by Scarborough et al (1999):

‘.... the systematic use of knowledge for economic objectives is clearly a feature of Taylorism and related methods.’ (Scarborough et al, 1999: 33)

KM emerged therefore, as:

‘.... a technocratic intervention, emphasising the use of IT and seeking to divorce the application of knowledge from its organisational context’ (Scarborough et al, 1999: 50)

A contribution made to this literature by this thesis is to demonstrate, not in any abstract way, but in a live case-study setting, that knowledge is socially-located and constructed, and that all coded information and computer systems are social systems. The thesis also demonstrates that failure to address these factors has significant, but not always immediately obvious negative effects. The current approach adopted by KM has, therefore, been shown to be simplistic, limited in scope and somewhat naïve. It is suggested that KM must have a social dimension if it is to realise its potential and avoid becoming just another management fad.

A further contribution here, which again reflects the simplicity of current KM approaches, is the extent to which knowledge types have been described and discussed. Typically in the KM literature the dimensions of knowledge which are addressed are tacit and explicit, subjective and objective. For instance, Nonaka (1995, 1998) asserts that knowledge comes in two forms. The first is tacit/ explicit, the second is informal/uncodified, and formal/codified. This thesis adds the further, critical and thus far unexplored dimensions of uncertain/certain and incomplete/complete. Individuals have been shown still to make sense with vague, uncertain and incomplete knowledge. In addition this thesis has demonstrated how the process of knowledge generation and application changes from novice to expert. Experts operate on mature understanding that is so much a part of them they are almost unaware of it. Novices are more tentative and aware of their use of knowledge in decision-making processes. This thesis provides, therefore, further depth and texture to the types of knowledge KM addresses.

Moreover, as stated earlier, the aim of KM is to ‘mine’ the tacit knowledge, skills and expertise of people (Gardner, 1998). As asserted by Nonaka (1998):

‘(KM) depends on tapping the tacit and often highly subjective insights, intuitions, and hunches of individual employees and making those insights available for testing and use by the company as a whole.’ (Nonaka, 1998: 24)

This is reminiscent of literature in the field of AI, and as this research has shown, the assumption that all knowledge is codifiable is wrong, and has consistently been proved so for some time by failures in AI. This thesis can, therefore, be said to have made a contribution to work in both of these fields. In addition, while hunches, etc. are discussed, scientism implicitly assumes an unproblematic and predictable relationship between knowledge, data, information and decision-making, which this thesis, in its exploration of clinical knowledge-creating and decision-making processes, has demonstrated cannot be assumed.

In summary, this thesis contributes to this area, and to AI, by demonstrating that rationalist assumptions about knowledge creation are inadequate and meaning cannot be transferred as easily as data, and also by providing detailed insights into the reasons for this. It has also shown that a broader approach to and definition of ‘knowledge management’ is not only possible but essential.

12.4 Contributions to IS, OT and Medical Informatics

It is also felt all of the above contributions are of importance to both the fields of IS and OT. As with KM, this thesis provides a useful resource in its description of the complexity of clinical knowledge contexts and processes, and the decision-making and behaviour associated with them. Also, as noted by Checkland and Holwell, (1998) the predominant model of organisation in both of these fields is either explicitly or implicitly philosophically positivistic and sociologically functionalist. This model overlooks a host of factors referred to above, including pluralism, any form of tribalism and fundamental differentiation. The systems which come from this view reflect this. This thesis demonstrates this was the situation in the NHS. What this thesis contributes is fuel for the argument that informed behaviour requires practitioners in both fields to take account of the wider organisational discourse within which the knowledge-creating of organisations is enacted. It has also demonstrated that this discourse takes

place in a multi-disciplinary setting, and emphasises the need for practitioners with a far wider range of insights than the literature would suggest is often the case.

These comments are also relevant to the field of Medical Informatics. The specific contribution has been analysis of clinical decision-making and information use in the integrated context of both the local clinical and wider organisational settings. This expands the traditional focus in this area from clinical knowledge and data through to statistical datasets. This can particularly inform work in the area of clinical systems which, to date, as noted by De Dombal (1996) have reflected largely simplistic representations of knowledge and organisation. This thesis has shown reality is much more complex than this, and that it may be more realistic to accept that a variety of investigative and explanatory tools are required. It has also shown that Medical Informatics practitioners must develop in the same ways as are suggested for IS practitioners above.

12.5 Contributions to Healthcare Management

Finally, this thesis makes a significant contribution to literature on the theory and practice of healthcare management. Recognition of the research problem is demonstrated in that literature at only the most superficial levels, hence attempts to achieve better quality clinical data by training coders how to use classifications, and a relentless pursuit of coded electronic records which carry with them all of the historical issues discussed throughout the thesis. This thesis indicates the need for a move away from that position, which would require a fundamental reassessment of approaches to managing the NHS and to people and systems within it, and which would also require a very different sort of manager. It also, however, provides substantial material to enable those changes to be made.

12.6 General Contributions

At a general level this thesis makes a contribution to all areas of literature discussed, because it draws together very different areas of conceptual work, and in an innovative, transdisciplinary way extracts their mutually influential aspects and demonstrates their

effects on socially significant classes of knowledge. As discussed, it also does this in a case study setting, which, for some areas of work in particular provides an essential application of theory to a real-life situation. This enables theory to be improved, or at least rendered more accessible to analysis and comment. It also provides substantiated insights to a real-world problem.

Lastly, this thesis also contributes to all literatures and theory focusing on knowledge, its creation, application, codification and computerisation.

Chapter 13, Personal Reflections

The process of research described in this thesis led to a number of findings specific to the research problem. It also resulted in a number of key learning points relevant to the researcher and the research process, which are described in this chapter.

One such learning point involved the notion of social constructivism, which was shown to apply to actors in the problem domain. Thus, the research process was designed, as far as possible, to identify and take account of their potential biases and prejudices, in order that their social constructions could be better understood. However, social constructivism also applied to the researcher. Consequently, throughout the research there was also a need for both epistemic and situational reflexivity by the researcher, which achieved and demonstrated awareness of how epistemological commitments influenced her social construction of reality during the research. This was a learning process of achieving self and situational awareness. It required reflexive examination and monitoring of the grounds and reasons underpinning the researcher's thoughts and actions relating to the problem and its context. It included consideration of the identification and scoping of the problem by the researcher, her choice of research methods, and the interactions and interpretations made. It also included awareness of the effect of the researcher and the field role upon the subjects and context of the research. This reflexivity was an essential element of the process of producing research findings that were defensible and significant in terms of the goals of the research. It was also felt to be even more valuable in this case, where the researcher had been a participant in the organisation and later became an observer. This history of participation brought with it significant insights, but these in turn carried the potential for increased levels of bias in the researcher's view of the problem and its context.

Thus reflexivity in this context was not simply a different and more self-aware way of looking at events for the researcher. Rather it involved all participants in the problem domain and demonstrated the inherent inter-connectedness of the researcher and the problem domain. This enriched the researcher's appreciation of reflexivity by enabling her to reposition it within the broader contexts of both Structuration Theory (Giddens, 1976, 1984) and ANT (Callon, 1986; Law, 1987; Latour, 1996a, 1996b). This also

further highlighted the situationally-dependent nature of reflexivity. It was approached as something which was never 'achieved', nor were methods of pursuing it ever considered to be definitive. Rather, as noted by Holland (1999) it was considered as part of an endless and dynamic process.

A further key learning point was that reflexivity clearly involved more than situational and epistemic awareness. This research required critical analysis of existing systems of knowledge which spanned the philosophical spectrum, at a level which could understand and articulate the sectional interests and power bases which sustained them, and which could evaluate the position of each through the lens of the other. As discussed by Holland (1999) this represents a 'transdisciplinary form of reflexivity' (Holland, 1999: 466) the value of which, it is argued, has been demonstrated in this thesis. This approach enabled dismantling of the boundaries of disciplines, paradigms and structures which, if left unaddressed, can preclude or severely limit critical analysis.

A second and related key learning point related to the completion of this thesis. Achieving sufficient transparency in the account of the research generally, and the reflexivity it involved, was a learning process. Specifically, it was one in which the perceptual and cognitive issues inherent in the faithful representation and transfer of knowledge, which were central to this thesis, were regularly encountered. In addition, the process of writing how and why particular understandings were arrived at was, in itself, part of the reflexive process. Writing was not confined, therefore, strictly to conveying understanding previously arrived at, or to consideration of presentational issues, important as they are to conveying meaning. It was also used as a method of further analysis of observations and findings. This lengthened the writing process, but was considered valuable in that the critical reflection it involved enabled findings to be further refined.

This leads to the final reflection, which it is hoped will be valuable to future researchers. This research was conducted on a part-time basis and production of this thesis was a lengthy process. Over such a protracted period of time it is always possible that all manner of personal and professional changes and events will occur, and in the event they did. It is suggested, therefore, that successful completion of such projects

requires substantial and sustained determination and concentration, and an ability to maintain a level of consistency despite sometimes lengthy interruptions. It also depends heavily on support from interested parties. The reward however is also substantial, in terms of both personal and professional development.

Appendix 1, Read 3 Contents

Occupations - Self- explanatory.

History and Observations- This chapter contains terms for clinical findings, which the literature says may be obtained from a clinical history, examination, assessment, special investigation or tests. The manner in which the information is collected is not included in the terms. This extra information is recorded in the patient record using what are known as 'qualifiers' (see below). Terms prefixed 'C/O' (complaining of) 'H/O' (history of) 'O/E' (on examination) and 'F/H' (family history of) are marked as optional and listed in the context-dependent chapter.

Disorders - This contains terms describing disease processes and abnormal function or form. The literature says they are arrived at by clinical interpretation.

Investigations - This lists laboratory tests and special clinical investigations. The terms describe the procedure rather than the results of the tests, which are listed in the History and Observations chapter.

Operations, Procedures and Interventions - This lists the physical procedures that are performed on the patient. These are usually therapeutic in nature, although it is recognised some may be done for diagnostic purposes, e.g. 'laparotomy' or 'needle aspiration of the breast'

Regimes and Therapies - This contains terms for a range of non-surgical treatments and regimes, e.g. psychotherapy.

Prevention - This contains terms to do with contraception, obstetric care, control of infectious diseases and childhood examinations, e.g. 'rhythm method contraception', 'child 3 month examination'.

Causes of Injury and Poisoning - This mirrors a chapter in the ICD-10 classification for External Causes of Morbidity and Mortality. This is due to the need for statutory classified data to be produced by any hospitals using Read 3 as the primary coding system. In this area, of Causes of Injury and Poisoning, the axes of description between the two systems are very different. The classification has an interest in types of events

which are of no apparent interest to working clinicians, e.g. 'cardiovascular devices associated with adverse incidents', 'legal execution by beheading'. In order to serve the needs of statutory data collection without diminishing the clinical relevance of Read 3, the only course open was to insert the classification chapter wholesale into Read 3 so that Read 3 users could provide statutory data. The same applies to the ICD-10 chapter for mental health disorders.

Tumour Morphology - This contains terms like 'small cell carcinoma'.

Staging and Scales - This contains a list of tumour 'staging' systems. These are designed to measure the progression of tumours.

Administration - At the time of writing, this chapter was being restructured. It contains terms relating to GP administrative work, such as 'patient temporarily left', or 'offered child surveillance'.

Context Dependent Categories - This contains terms already embedded in 'core terms' as opposed to 'qualifying terms', and also offered separately here, e.g. 'complaining of'. A 'Context of Care' project had been undertaken, which delivered a number of terms describing the 'context' of a concept, e.g. 'ordered', and 'done'.

Qualifiers - This contains terms which add extra detail to core terms (see below).

Attribute - This contains terms such as 'causative agent', 'site', 'laterality', and 'priority'. The attribute describes the relationship between the extra detail and the core term. The value is the detail itself.

Value - The following chapters contains terms that are used as values:

Drugs - This covers the range of drugs that can be prescribed under the NHS. Specialist sections include specialist foods, dialysis fluids, radio-pharmaceuticals and camouflage cosmetics, e.g. 'Digoxin 125 milligram tablet'.

Appliances and Equipment - This contains all prescribable products in the Drug Tariff for England and Wales, e.g. 'cotton crepe 5cm bandage BP'.

Unit - This contains SI and other units used in the clinical record, e.g. 'mm Hg' (millimeters of Mercury).

Organisms - This includes a list of plants, animals, insects and all micro-organisms that are considered to be of significance to humans, e.g. 'staphylococcus auras'.

Anatomical Site - This contains what are described as a comprehensive set of anatomical terms, sufficient to add detail to core terms in both disorders and procedures and regional and systematic anatomy, e.g. 'Pouch of Douglas', 'superior mesenteric artery'.

Additional Values – This contains structured lists of the remaining values, e.g. 'substances', 'objects', 'definite', 'mild'.

Read Thesaurus Concept Type - Each Read code concept is labelled as being of a certain 'type', as detailed in the headings in this list, e.g. 'procedure type', 'prevention type' etc.

It is assumed that users will not normally use the latter two chapters.

Appendix 2, ICD-10 Contents

Certain infectious and parasitic diseases

Neoplasms

Diseases of the Blood and blood-forming organs and certain disorders involving the immune mechanism

Endocrine, metabolic and nutritional diseases

Mental and behavioural disorders

Diseases of the nervous system

Diseases of the eye and adnexa

Diseases of the ear and mastoid process

Diseases of the circulatory system

Diseases of the respiratory system

Diseases of the digestive system

Diseases of the skin and subcutaneous tissue

Diseases of the musculo-skeletal system and connective tissue

Diseases of the genito-urinary system

Pregnancy, childbirth and the puerperium

Certain conditions originating in the perinatal period

Congenital malformations, deformations and chromosomal abnormalities

Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified

Injury, poisoning and certain other consequences of external causes

External causes of morbidity and mortality

Factors influencing health status and contact with health services

Morphology of neoplasms

Appendix 3, Hospital Consultation Transcript

a. GP Referral Letter:

Dear Mr. X

Thankyou for seeing this young boy who has a right-sided hydrocele and a rather tight foreskin. He has had 2 episodes of balanitis but I think this will probably settle on its own.

I am concerned however that his hydrocele is persistent and would be grateful for your advice about further management.

Yours sincerely

Dr W

Again the casenote was brought into the treatment room, where the patient was waiting with his mother and, after the usual greetings and putting the patient at ease, the GP referral letter was used as a basis for opening the discussion:

-So I see from this that there is some swelling to the testicle.

-Yes. Originally the foreskin was tight but antibiotics cleared that up, but his testicle is still swollen.

The Consultant then performed digital examination of the child, asking his mother who was also present:

-How long have you been aware of the swelling?

-About a month.

-The foreskin does look tight but I suggest we do nothing now. If there are repeated infections we would need to consider circumcision, but I really think this will settle down on its own and be perfectly normal.

He then examined the child further, explaining to the mother, who expressed concern that only one testicle seemed to be present, that both were there. He then explained that he thought the problem was a hydrocele (a swelling in the scrotum containing fluid). He further explained that a small operation would be necessary to sort it out. He also

advised that a small trace of protein had been found in the urine sample the clinic had taken, and that that it would be analysed to check for infections.

b. Casenote sheet written by the Consultant:

^
| size
Blood o
-swlg L scrotum
-tests--
Swlg R scrotum
tight foreskin
R hydrocele
TCI - ligation R Hydrocele

He then dictated a letter to the child's GP, using the above notes as the basis for it. He also completed the structured proforma for coding and a further proforma to put the child on the waiting list for treatment, detailing demographics, operations, laterality, whether it was a day case or not, number of days before admission, priority, referring GP, contract identifier, whether or not it was an extra contractual referral, whether it was a waiting list case, whether it was booked or planned, and who the patient was being referred from and to. The case note and pro forma were processed in the same way as for Patient A in the main body of the text (see chapter 7).

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